Field Guide to the Plant Community Types of Voyageurs National Park

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Preface

The U.S. Geological Survey-National Park Service Vegetation Mapping Program has been supporting the development of vegetation classifications and maps for many of the National Parks across the country. The classification and map report for Voyageurs National Park was completed in 2001 (Hop and others, 2001). To make that information more accessible, we decided to produce a more field-oriented version of the report. In the meantime, additional vegetation plot information became available through the efforts of the Minnesota Natural Heritage and Nongame Research Program and the Minnesota County Biological Survey. At the same time, those same programs collaborated on a new native plant community classification of the state (Minnesota Department of Natural Resources, 2003). We incorporated this new information when producing this field guide, while still retaining the essential features of the original classification and map.

The vegetation classification system, originally developed under the auspices of The Nature Conservancy, has since 2000 been maintained and expanded by NatureServe. NatureServe staff and contractors also provided valuable assistance and expertise in the creation of map units. The USGS Upper Midwest Environmental Sciences Center produced the vegetation map of Voyageurs National Park, provided project coordination, and compiled all final products.

The format of this manual owes much to the excellent tradition of field guides to vegetation in Canada, especially those in northwestern Ontario by Sims and others (1989, 1997) and Harris and others (1996). This manual is unique in that it covers all vegetation types within the Park, not just wetlands or forests. Because of the similarity of the vegetation—Voyageurs National Park borders on northwestern Ontario—we crosswalked vegetation types from the Park to those manuals, yet retained the nomenclature and structure of the U.S. National Vegetation Classification.

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Regarding the field guide itself, we are thankful to Moy Burns for assisting with editing the fact sheets. We thank Jerry Cox for his careful attention to all aspects of copy-editing, publication layout, and final production of the field manual.

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Introduction

The objective of the U.S. Geological Survey-National Park Service Vegetation Mapping Program is to classify, describe, and map vegetation for most of the park units within the National Park Service (NPS). The program was created in response to the NPS Natural Resources Inventory and Monitoring Guidelines issued in 1992. Products for each park include digital files of the vegetation map and field data, keys and descriptions to the plant communities, reports, metadata, map accuracy verification summaries, and aerial photographs. Interagency teams work in each park and, following standardized mapping and field sampling protocols, develop products and vegetation classification standards that document the various vegetation types found in a given park.

The use of a standard national vegetation classification system and mapping protocol facilitate effective resource stewardship by ensuring compatibility and widespread use of the information throughout the NPS as well as by other Federal and state agencies. These vegetation classifications and maps and associated information support a wide variety of resource assessment, park management, and planning needs, and provide a structure for framing and answering critical scientific questions about plant communities and their relation to environmental processes across the landscape. This field guide is intended to make the classification accessible to park visitors and researchers at Voyageurs National Park, allowing them to identify any stand of natural vegetation and showing how the classification can be used in conjunction with the vegetation map (Hop and others, 2001).

Voyageurs National Park

Voyageurs National Park was authorized in 1971 and established in 1975. The Park extends for more than 50 km along the Canadian–United States international border, from 29 km east of International Falls to the western edge of the Boundary Waters Canoe Area (BWCA) in the Superior National Forest (fig. 1). It covers 88,244 ha, of which 61.6% (54,336 ha) is land, the rest open lakes and ponds. Four large lakes compose the majority of the water area. Lakes, bays, and land masses specifically referenced in this field guide, along with some points of interest, are shown in Figure 2.

Figure 1. Location of Voyageurs National Park in northern Minnesota.

The climate is mid-continental with a mean annual temperature of 1.4°C, extremes of -40 and 36°C, and a mean annual precipitation of 63 cm (Kurmis and others, 1986). The landscape is rugged Canadian Shield terrain consisting of Early Precambrian granite (more common in the southern part of the Park), biotite schist (more common in the north), and migmatite (interlayered granite and biotite). A greenstone belt outcrop occurs in a limited region of the northwestern part of the Park. Mafic dikes occur in localized areas. Prolonged erosion and glacial scouring during the Pleistocene have produced the current surficial geology features, which include sandy loam tills, lacustrine deposits (particularly on the western edge from glacial Lake Agassiz, but also in localized lowlands and bedrock depressions), and localized outwash deposits of sand and gravel (Okajangas and Matsch, 1982).

Soils formed in the glacial deposits range from thin, loamy, and well drained, often in raised areas with bedrock outcrops, to thick, clayey, and poorly drained low-lying areas (Kurmis and others, 1986). The topography

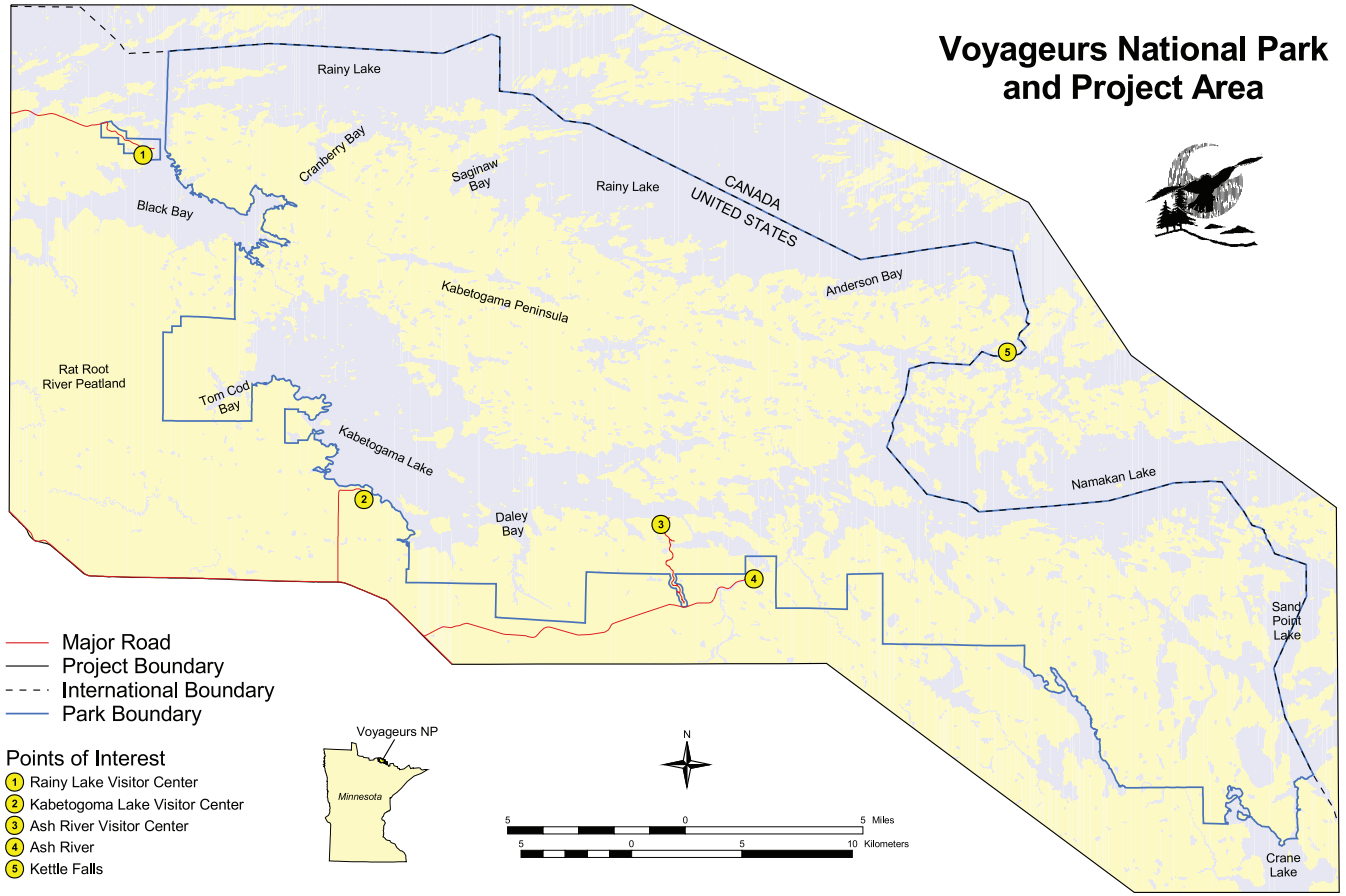


Figure 2. Lakes, bays, and land masses referenced in the field guide, along with various points of interest.

of the area is a complex pattern of low ridges and valleys, with a maximum relief of 90 m (Johnston and Naiman, 1990), but more typically 20–30 m. All of Voyageurs National Park falls in one ecological land unit at the subsection level, the Border Lakes subsection (212La of Keys and others, 1995).

Before settlement and logging, which began around 1875 and ended in the early 1970s (cutting almost all of the Park forests in the process), the vegetation consisted of jack pine forests with rocky outcrops, white and red pine forests, spruce-fir and aspen forests, black spruce-tamarack bogs and swamps, fens, wet meadows, marshes, and aquatics (Marschner, 1974; Kurmis and others, 1986). Periodic fires before and after settlement favored the fire-dependent pines, as well as the aspen-birch forests. Based on analyses from the adjacent BWCA (Heinselman, 1996), fires could sweep through thousands of acres at a time. Heinselman's work indicated that jack pine stands in the BWCA had high-intensity catastrophic burns every 50–100 years, whereas red pine and white pine generally had more frequent low-intensity burns every 30–40 years, but less frequent high-intensity burns every 200 years or so. Windstorms, spruce-budworm disease, herbivores, and beaver activity are other disturbance factors acting in the Park (Johnston and Naiman, 1990; Crowley, 1995).

U.S. National Vegetation Classification

The U.S. National Vegetation Classification (USNVC) is used for park classification and mapping. The classification is vegetation based, emphasizes existing natural vegetation, uses a combined physiognomic-floristic hierarchy, and is appropriate for mapping at multiple scales. It was developed and implemented by NatureServe (formerly with The Nature Conservancy) and the network of Natural Heritage Programs over the past 20 years (Grossman and others, 1998), in cooperation with Federal, state, and international partners. Support has come from Federal agencies, the Federal Geographic Data Committee (1997), and the Ecological Society of America (Jennings and others, 2004). It is part of a larger International Vegetation Classification (IVC) system that includes Canada and parts of Latin America. Classification is refined in the process of application, leading to ongoing proposed revisions that are reviewed locally, as occurred during the Voyageurs project, and nationally and internationally as information from Voyageurs was compared with other information available in the northern United States and Canada.

The USNVC extends to all existing upland and wetland vegetation, whether natural or cultural. It presently includes mostly natural vegetation types, the focus of the current partners. "Natural vegetation" as defined in Grossman

and others (1998) includes types that "occur spontaneously without regular management, maintenance, or planting and have a strong component of native species." "Cultural vegetation" includes planted or cultivated vegetation types such as orchards, pastures, and vineyards. The hierarchy has seven levels (five upper physiognomic levels and two lower floristic levels). The basic unit of the physiognomic portion of the classification is the "formation," a type defined by dominance of a given growth form(s) in the uppermost layer of vegetation, as well as characteristics of the environment (e.g., temperate cold-deciduous broad-leaved forests). Criteria from these levels facilitate broad-scale mapping. The floristic levels include alliances and associations, which are more local or regional plant community types, based on differences in species composition (e.g., white spruce-fir forests, black ash swamps). The association is defined as "a plant community of definite floristic composition, uniform habitat conditions, and uniform physiognomy" (see Flahault and Schroter, 1910, in Moravec, 1993). The focus of this field guide is on descriptions of associations.

Development of associations at Voyageurs is summarized in detail in Appendix 1 (see also Faber-Langendoen and others, 2007). Briefly, detailed vegetation plots were collected throughout the Park by an ecology field team from 1996 to 1998 (fig. 3). Plots contain a comprehensive list of all plant species found in the plot, listed by layer (tree, shrub, field, moss-lichen), and abundance estimated using percent cover, with supplementary information on site factors. The Park was stratified into the western peatland area (Rat Root River Peatland), which falls mostly outside the Park boundaries; the northern unit, where the bedrock is primarily biotite schist (metasedimentary rocks) with local areas of greenstone; and a southern unit, where the bedrock is primarily granite (the Vermillion granitic complex: Okajangas and Matsch, 1982). Project requirements permitted only about three plots per type, but less well-understood types were sampled more extensively and rare types less. Also, as part of the mapping field work, an additional 1281 observation plots were collected across the Park. Observation plots contain information on the dominant and characteristic species in the plot and a few basic environmental factors (slope, elevation, topographic position, hydrological regime, evidence of disturbances), and were used in part to assess the accuracy of the photointerpretation mapping process. The 191 detailed vegetation plots were entered into the Minnesota Natural Heritage database and a larger dataset of 259 plots was created that included samples from other investigators taken in the same area. Quantitative analyses were completed and reviewed, and decisions on plant community (association) types in Voyageurs were made based on both park and regional scale patterns. In this way, a standardized

Figure 3. Trekking toward a Black Spruce / Labrador Tea Poor Swamp association (A3) for field data collection.

classification was developed that provides the Park with a set of types that can be applied both within and outside the Park, including adjacent state and national forest lands. The 1281 observation plots were also summarized and used to supplement information based on the plots. All data were then summarized into the fact sheets presented in this manual. The classification was also used to guide the mapping of the vegetation across the Park (Hop and others, 2001, Appendix F).

Associations are aggregated by Ecological System types (Comer and others, 2003), a relatively new classification approach that can be applied in conjunction with the USNVC. Ecological Systems group the associations by their shared spatial and ecological features rather than by vegetation taxonomic similarities, as done by the USNVC hierarchy. These ecological system types provide the organizational structure for the association fact sheets in this manual.

Dichotomous Field Key to the Plant Communities at Voyageurs National Park

How to use the Key

General

This is a key to the natural plant community types identified in the Park. Cultural types such as old fields, pastures, yards, etc., are not included. For the full list of types that are covered by this key, see the "Fact Sheets: List of Plant Communities."

"Dominance" in the context of forest, shrub, and herbaceous communities means >60% cover. In the context of woodland communities, dominance means >25% cover.

An association may key out in multiple places in the key, therefore always verify the decision as to what type you are in by reading the fact sheet description. Check related types to determine the key characteristics that define the type you have keyed out.

Season of use

This classification works best during the optimal growing season of the understory species, which is usually from late June to early September. However, familiarity with the woody species during leaf-off or early and late in the growing season should allow you to key out many of the types from April to November.

Plot size

Identification of a type in the field should be done using a relatively homogeneous area between 400 and 1000 m^2. For example, one could define a square area of 20 x 20 m (400 m^2) or a circular area with a radius of 18 m (~1000 m^2).

Estimating percent cover

Cover is the percentage of a plot area beneath a canopy of a given species (e.g., jack pine) or combination of species (e.g., all conifer trees). Cover values must be estimated in order to apply many of the decision rules in the key. It can readily be applied to an understory species by looking down within the area and estimating the cover to the nearest 5%. For overstory species, one must look up into the canopy and estimate the cover. Cover is based on the

outline of individual tree canopies, and holes in the canopy of a single tree need not be subtracted from the cover.

When the term "total tree canopy cover" is used, this refers to the absolute canopy cover of all tree species combined, ignoring overlap. All other cover values refer to relative canopy cover (e.g., if total canopy cover is 40%, >25% cover of tamarack refers to 25% of the 40% total cover).

Species

Species listed after "*" are indicator species for that community type and are often present. Other species listed are typical dominants in the type (i.e., they often contain 5% or more cover).

Soil/substrate

Two terms are often used to distinguish soil types.

"Mineral soils" are mixtures of sand, silt, clay, sometimes with rocks or boulders. Wetland mineral soils can be mucky, or have a shallow layer of organic matter.

"Peat soils" are soils with at least 30–40 cm of organic matter and composed of sedge, wood, or moss.

Hydrologic regime

The hydrologic, or water, regime describes the frequency and duration of flooding, and is an important influence on wetland associations (Cowardin and others, 1979; Harris and others, 1996). The following regimes are noted in the key or fact sheets:

permanently flooded – water covers the land surface throughout the year in all years, except extreme drought.

semi-permanently flooded – surface water persists throughout the growing season in most years. The land surface is normally saturated when water levels drop below the surface.

seasonally flooded – surface water is present for extended periods, especially early in the growing season, but is absent by the end of the growing season in most years. Seasonal flooding does not include ponding after rains or surface water runoff.

temporarily flooded – surface water is present for brief periods during the growing season, but the water table usually lies well below the surface.

saturated – surface water is seldom present, but substrate is saturated to surface for extended periods during the growing season.

Rich/poor

These expressions are used to describe associations in relative terms. In peatlands, they typically are used to describe the mineral (Ca^{++}, Mg^{++}) status of the surface water of an association relative to others. The term "minerotrophic indicator" is also used to describe species that are found in relatively richer sites.

Soil drainage

well drained – broadly used term to include rapidly to somewhat poorly drained soils, where soil moisture content varies from very low throughout most of the profile to somewhat high in lower horizons but not in the upper layer.

poorly drained – broadly used term to include poorly and very poorly drained soils where soil moisture content is high in all soil layers, and water may be present in the soil horizon within 30 cm of the surface for much of the growing season.

Vegetation

Trees – Larger woody plants, often single stemmed, mostly well above 5 m tall.

Shrubs – Smaller woody plants, often multi-stemmed at the ground, and mostly between 0.5 and 5 m tall. The shrub layer includes the cover of both shrubs and tree saplings (trees between 0.5 and 5 m tall).

Dwarf-shrubs – Low shrubs spreading near the ground surface, <50 cm high.

Herbs – Plants without perennial aboveground woody stems, including graminoids, forbs, and ferns. Dwarf-shrubs and herbs together constitute the "field" layer.

Moss-Lichen – Nonvascular plants including mosses, lichen, and liverworts.

Plant scientific names

Scientific names used in this document are from Ownbey and Morley (1991).

Key to the Associations

1. UPLANDS. Absence of standing water and/or peat soil. Mineral soil that is not saturated throughout the growing season.

2. Well drained soils. Canopy dominated by one or more of the following: *Pinus* spp., *Quercus* spp., *Picea* spp., *Betula* spp., *Populus tremuloides, P. grandidentata.* If dominated by *Populus tremuloides* or *P. grandidentata* then *P. balsamifera, Thuja occidentalis,* or *Fraxinus nigra* present in canopy or shrub layers at <10% cover.

3. Dominated by shrubs or herbaceous vegetation. Total tree canopy <25%.

4. Dominated by herbaceous vegetation (shrub cover <25%). **Poverty Grass Granite Barrens (A35a)**

4. Dominated by shrubs (shrubs >25% cover). **Boreal Hazelnut - Serviceberry Rocky Shrubland (A35)**

3. Forest or Woodland. Total tree canopy >25% (or if <25%, dominated by bedrock and lichens, not shrubs).

5. Canopy dominated by evergreen trees or a mixture evergreen and deciduous trees. Percent cover of evergreen trees in canopy >25%.

6. Canopy dominated by *Pinus banksiana* with or without *Quercus ellipsoidalis* or *Populus* spp.

7. Canopy consisting primarily of *Pinus banksiana. Quercus ellipsoidalis* or *Populus* spp. absent or present <25%.

8. Woodland. Total tree canopy cover <60% and canopy closure prevented by the presence of exposed bedrock.

9. Sparsely vegetated, total tree canopy cover <25%. Dominated by bedrock and lichens. **Jack Pine / Lichen Rocky Barrens (A31)**

9. Total tree canopy cover 25–60%. **Boreal Pine Rocky Woodland** (jack pine phase) **(A32)**

8. Forest. Total tree canopy cover >60%. Or, if <60%, then canopy closure not prevented by the presence of exposed bedrock. **Jack Pine / Balsam Fir Forest (A40)**

7. Canopy consisting of a mix of *Pinus banksiana* and *Populus* spp. or *Pinus banksiana* and *Quercus* spp. Deciduous trees comprising >25% cover.

10. Canopy consisting of a mix of *Pinus banksiana* and *Populus* spp. each with >25% cover. **Jack Pine -**

Aspen / Bush Honeysuckle Forest (A41). This type is uncommon.

10. Canopy consisting of *Pinus banksiana* and *Quercus ellipsoidalis* each with >25% cover. *Populus* spp. absent in canopy or present at <25% cover. **Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland** (jack pine-oak phase) **(A33)**

6. Canopy dominated by *Pinus strobus, Pinus resinosa, Picea* spp., *Populus* spp., and/or *Betula papyrifera.*

11. Canopy dominated by *Pinus resinosa* and/or *Pinus strobus*. Or canopy a mix of *Pinus resinosa* and *Pinus strobus* with *Populus* spp. and/or *Betula papyrifera*.

12. Forest. Total tree canopy cover >60%. Or, if <60%, then canopy closure not prevented by the presence of exposed bedrock.

13. Dominant conifer *Pinus strobus*. *Pinus resinosa* in canopy <60%.

14. <25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **White Pine / Mountain Maple Mesic Forest Community (A39)**

14. >25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **White Pine - Aspen - Birch Forest (A38)**

13. Dominant conifer *Pinus resinosa* (may contain <25% *P. strobus* in canopy).

15. <25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **Red Pine / Blueberry Dry Forest Community (A36)**

15. >25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **Red Pine - Aspen - Birch Forest Community (A37)**

12. Woodland. Total tree canopy cover <60% and canopy closure prevented by the presence of exposed bedrock. *Pinus strobus* and *Pinus resinosa* common, *Picea* spp. uncommon, with or without a mixture of hardwoods, typically *Populus* spp. and/or *Betula papyrifera*.

16. <25% hardwoods (typically *Populus* spp. and/or *Betula papyrifera*) in canopy. **Boreal Pine Rocky Woodland** (mixed pine phase) **(A32)**

16. >25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland** (mixed pine-oak phase) **(A33)**

11. Canopy dominated solely by *Picea* spp. or a mixture of *Picea* spp. with *Populus* spp. and/or *Betula papyrifera*.

17. Woodland. Total tree canopy cover <60%, and canopy closure prevented by the presence of exposed bedrock.

18. <25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **Boreal Pine Rocky Woodland** (mixed pine phase) **(A32)**. This is an uncommon variant of the mixed pine phase.

18. >25% hardwoods (*Populus* spp. and/or *Betula papyrifera*) in canopy. **Northern Pin Oak - Bur Oak (Jack Pine) Rocky Woodland** (mixed pine-oak phase) **(A33)**. This is an uncommon variant of the mixed pine-oak phase.

17. Forest. Total tree canopy cover >60%. Or, if <60%, then canopy closure not prevented by the presence of exposed bedrock.

19. Canopy dominated solely by *Picea* spp. Percent cover of *Populus* spp. and/or *Betula papyrifera* <25%.

20. Canopy dominated exclusively by *Picea mariana.* **Black Spruce / Feathermoss Forest (A42)**

20. Canopy dominated by *Picea glauca* (*P. mariana* may be present). **Spruce - Fir / Mountain Maple Forest Community (A43)**

19. Canopy a mixture of *Picea* spp.*, Abies balsamea* and *Populus* spp. and/or *Betula papyrifera.* Percent canopy cover of these hardwoods >25%. **Spruce - Fir - Aspen Forest (A44).** The following two communities are minor variants of the Spruce - Fir - Aspen Forest and each is treated as a phase of that community.

21. Canopy a mixture of *Abies balsamea* and *Betula papyrifera.* **Balsam Fir - Paper Birch Forest (CT1)**

21. Canopy a mixture of *Picea mariana* and *Populus* spp. and/or *Betula papyrifera.* **Black Spruce Aspen Forest (CT2)**

5. Canopy dominated by deciduous trees. Percent cover of evergreen trees in canopy <25%.

22. Canopy dominated by *Quercus macrocarpa*, *Q. ellipsoidalis*, *Tilia americana* or *Fraxinus pensylvanica*.

23. Forest or woodland canopy dominated by *Q. ellipsoidalis*. Or woodland dominated by *Q. macrocarpa* with <60% cover and canopy closure prevented by the presence of exposed bedrock. **Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland** (deciduous phase) **(A33)**

23. Canopy dominated by *Quercus macrocarpa*, *Fraxinus pensylvanica,* and/or *Tilia americana*. Forest. Total tree canopy cover >60% and canopy closure not prevented by the presence of exposed bedrock. **Northern Bur Oak Mesic Forest (A49)**

22. Canopy dominated by *Populus* spp. and/or *Betula papyrifera*.

24. Forest. Total tree canopy cover >60%. Or, if <60%, then canopy closure not prevented by the presence of exposed bedrock.

25. Canopy dominated by *Populus* spp.

26. *Acer rubrum* absent in the canopy. **Aspen - Birch / Boreal Conifer Forest (A46)**

26. *Acer rubrum* present in the canopy. **Aspen - Birch - Red Maple Forest (A47)**, a very minor type.

25. Canopy dominated by *Betula papyrifera. Populus* spp. <10%. **Paper Birch / Fir Forest (A45)**

24. Woodland. Total tree canopy cover <60% and canopy closure prevented by the presence of exposed bedrock. Canopy cover <60%. **Mixed Aspen Rocky Woodland (A34)**

2. Poorly drained soils, canopy dominated by *Populus* spp.*, Fraxinus nigra, Thuja occidentalis*. If dominated by *Populus* spp. then *P. balsamifera, Thuja occidentalis,* or *Fraxinus nigra* present in canopy or shrub layers at >10% cover.

27. Canopy dominated by *Populus* spp. or a mix of *Populus* spp. and *Thuja occidentalis*

28. *Thuja occidentalis* absent or present <25% cover. **Trembling Aspen - Balsam Poplar Lowland Forest (A13)**

28. *Thuja occidentalis* present in the canopy or subcanopy >25% cover. **White Cedar - Yellow Birch Forest (A48)**

27. Canopy dominated by *Fraxinus nigra* and/or *Thuja occidentalis*.

29. Canopy consists solely of *Fraxinus nigra* (*T. occidentalis* may be present in the sub-canopy).

30. Canopy of *F. nigra* with >25% *T. occidentalis* in subcanopy. **White Cedar - Black Ash Swamp (A15)**

30. Canopy of *F. nigra* with <25% *T. occidentalis* in the subcanopy. **Black Ash - Mixed Hardwood Swamp (A14)**

29. Canopy consists solely of *T. occidentalis* (*F. nigra* <25%) or consists of a mix of *T. occidentalis* and *F. nigra* each comprising at least 25% cover.

31. Canopy dominated by *T. occidentalis* with <25% *F. nigra*. **White Cedar - Boreal Conifer Mesic Forest (A12)**

31. Canopy mixed *T. occidentalis* and *F. nigra* with at least 25% cover of each. **White Cedar - Black Ash Swamp (A15)**

1. WETLANDS. Presence of standing water, saturated mineral soil, or peat soil.

32. Non-peatland wetlands, *Sphagnum* spp. absent or present <25% cover.

33. Permanently flooded. Standing water ≥0.5 meters deep.

34. Dominated by *Typha* spp., *Carex lasiocarpa*, *Equisetum fluviatile* or *Phragmites australis*.

35. Dominated by *Typha* spp. **Midwest Cattail Deep Marsh (A24)**

35. Dominated by *Carex lasiocarpa, Equisetum fluviatile,* or *Phragmites australis*.

36. Dominated by *Carex lasiocarpa*. **Wiregrass Sedge Shore Fen (A11)**

36. Dominated by *Equisetum fluviatile* or *Phragmites australis*.

37. Dominated by *Phragmites australis.* **Eastern Reed Marsh (A25)**

37. Dominated by *Equisetum fluviatile.* **Water Horsetail - Spikerush Marsh (A27)**

34. Dominated by one or more of the following: *Potamogeton* spp.*, Scirpus* spp.*, Zizania palustris, Brasenia schreberii, Nymphaea odorata.*

38. Dominated by floating water aquatics especially *Brasenia schreberii* or *Nymphaea odorata* (>10% cover). **Northern Water Lily Aquatic Wetland (A30)**

38. Dominated by emergent or submerged aquatics. *Potamogeton* spp.*, Scirpus* spp. or *Zizania palustris.* Usually located on large, open lakes or bays.

39. Dominated by submerged aquatics *(Ceratophyllum demersum, Potamogeton* spp.*, Myriophyllum* spp.). Emergent and floating aquatics <10% cover. **Midwest Pondweed Submerged Aquatic Wetland (A29)**

39. Dominated by emergent aquatics (submerged aquatics may be present).

40. Dominated by *Zizania palustris*. **Wild Rice Marsh (A28)**

40. Dominated by *Scirpus* spp. **Freshwater Bulrush Marsh (A26)**

33. Not permanently flooded. Or, if permanently flooded, then standing water ≤0.5 meters deep.

41. Dominated by trees (*Populus* spp.*, Fraxinus nigra, Thuja occidentalis*). Go to couplet 26.

41. Dominated by shrubs, graminoids, or herbs.

42. Shrub dominated.

43. Dominant shrub *Alnus incana*. **Speckled Alder Swamp (A19)**

43. Dominant shrubs *Salix* spp. and/or *Cornus* spp. **Dogwood - Pussy Willow Swamp (A21)**

42. Graminoid or herb dominated.

44. Community dominated by *Calamagrostis canadensis*. **Canada Bluejoint Eastern Meadow (A23)**

44. Community not dominated by *Calamagrostis canadensis*. Community dominated by *Equisetum fluviatile, Carex* spp. or *Typha* spp.

45. Dominated by *Equisetum fluviatile*. **Water Horsetail - Spikerush Marsh (A27)**

45. Not dominated by *Equisetum fluviatile*. Dominated by *Carex* spp. and/or *Typha* spp.

46. Percent cover of *Carex* spp. 50% or greater. **Northern Sedge Wet Meadow (A22)**

46. Percent cover of *Carex* spp. <50%. Community dominated by *Typha* spp. **Midwest Cattail Deep Marsh (A24)**

32. Peatlands. *Sphagnum* spp. present >25% cover.
47. Dominated by shrubs or graminoids, trees <25% cover.
48. Dominated by graminoids.
49. Dominated by *Carex lasiocarpa*. Community restricted to water tracks of Rat Root River Peatland **Northern Sedge Poor Fen (A7)** (if also containing *Chamaedaphne calyculata* and other acidic indicators), else **Boreal Sedge Rich Fen (A10)**. See also **Wiregrass Sedge Shore Fen (A11)**
49. Not dominated by *Carex lasiocarpa.* Community found outside Rat Root River Peatland. Dominated by *Carex* spp. (commonly *C. lacustris, C. rostrata, C. vesicaria,* and/or *C. stricta*). **Northern Sedge Wet Meadow (A22)**

48. Dominated by shrubs.
50. Dominated by *Salix* spp. and/or *Cornus* spp. **Dogwood - Pussy Willow Swamp (A21)**
50. Dominated by *Alnus incana*, *Chamadaphne calyculata,* or *Betula glandulifera.*
51. Dominated by *Alnus incana*. **Speckled Alder Swamp (A19)**
51. Dominated by *Chamadaphne calyculata* and/or *Betula glandulifera*.
52. Minerotrophic indicators present (e.g., *Salix* spp.*, Betula glandulifera, Alnus incana, Equisetum fluviatile, Calamagrostis canadensis, Spirea alba, Campanula aparanoides,* or *Myrica gale*). Commonly shoreline situations.
53. >25% *Betula glandulifera* (*Chamadaphne calyculata* and *Salix* spp. may also be present). Common in shoreline situations throughout the Park. **Bog Birch - Willow Shore Fen (A8)**
53. <25% *Betula glandulifera*. Community dominated by *Chamadaphne calyculata*. Other shrubs present but cover <25%.
54. *Betula glandulifera* or *Myrica gale* common, and other acidic ericaceous shrubs (e.g., *Kalmia polifolia*) rare; found in shoreline situations. **Leatherleaf - Sweet Gale Shore Fen (A9)**

54. *Myrica gale* absent and other acidic ericaceous shrubs (e.g., *Kalmia polifolia*) common; found inland from shores or in inland basins. **Leatherleaf Poor Fen (A6)**

52. Minerotrophic indicators absent. Not (or rarely) shoreline situations.

55. Dominated by *Chamadaphne calyculata*. Conifers (usually *Picea mariana* and *Larix laricina*) <10% cover. **Leatherleaf Bog (A3)**. Found in Rat Root River Peatland only, often in close juxtaposition with A2.

55. Dominated by *Chamadaphne calyculata*. Conifers (usually *Picea mariana* and *Larix laricina*) 10–25% cover. **Black Spruce / Leatherleaf Semi-treed Bog (A2)**. Found in Rat Root River Peatland and drainage between Cranberry Bay and Black Bay.

47. Dominated by trees, total tree canopy cover >25%. Woodland or forest physiognomy.

56. *Larix laricina* present >25% cover.

57. Dominated by *Larix laricina*. Other conifers absent or present <25%.

58. Graminoid layer dominated by *Carex lasiocarpa*. Restricted to Rat Root River Peatland. **Tamarack Scrub Poor Fen (A5)**

58. Graminoid layer not dominated by *Carex lasiocarpa*. Not restricted to Rat Root River Peatland. **Northern Tamarack Rich Swamp (A18)**

57. Dominated by mixture of *Larix laricina* and other conifers (*Picea mariana, Thuja occidentalis*). Other conifers present >25% cover.

59. Dominated by mixture of *Larix laricina* and *Picea mariana*. Woodland or forest physiognomy. **Black Spruce / Labrador Tea Poor Swamp** (mixed phase) **(A4)**

59. Dominated by mixture of *Larix laricina and Thuja occidentalis*. Woodland or forest physiognomy. **White Cedar - (Mixed Conifer) /Alder Swamp** (tamarack phase) **(A17)**

56. *Larix laricina* absent or present <25% cover. Dominated by *Picea mariana* or *Thuja occidentalis*.

60. Dominated by *Thuja occidentalis*.

61. *Fraxinus nigra* in canopy <25% cover. **White Cedar - (Mixed Conifer) / Alder Swamp (A17)**

61. *Fraxinus nigra* in canopy >25% cover. **White Cedar - Black Ash Swamp (A15)**

60. Dominated by *Picea mariana*.

62. *Alnus incana* dominant in shrub layer. Other minerotrophic species present, including *Carex lacustris, Dryopteris carthusiana* and *Calamagrostis canadensis.* **Black Spruce / Alder Rich Swamp (A16)**

62. *Alnus incana* not dominant in shrub layer. Minerotrophic species absent.

63. Present in confined basins. **Black Spruce / Labrador Tea Poor Swamp** (evergreen phase) **(A4)**

63. Present within large peatlands. Restricted to the Rat Root River Peatland and large peatland between Cranberry Bay and Black Bay. **Black Spruce Forested Bog (A1)**

How to Read the Fact Sheets

Each fact sheet describes an association (A-type) found at Voyageurs based on the combination of detailed vegetation plots (259) and observation plots (1281) collected in the Park. These fact sheets describe the most typical conditions of the type.

Layout and Conventions

Colored Box with Number: The color of the box helps identify the System the type belongs to, and is coordinated with the association number code on the ordination diagram. For example, a red box is for the Bog System, and all bog associations (A1, A2, and A3) are colored red (see below for "ordination"). The number A20 was skipped (at one point a split of A21 (Alder Swamp) into minerotrophic and peat swamp types was considered, but there were insufficient data to make that decision here) and A35a was added late to the manual (and is most similar to A35).

Name: Two names are provided; one is the common name (in bold), the other is the scientific name based on the Latin names of the species. Both are standard NVC names. The common name, along with the number code, is used in the text.

Photograph: A photograph of a stand or occurrence of the type in Voyageurs National Park**.**

Ordination: The ordination diagram showing wetland or upland associations. Separate ordinations are provided for wetland types A1–A23 (marsh and aquatic vegetation types A24–A30 excluded) and for uplands A32–A49 (open bedrock communities A31, A35, A35a are excluded). The ordination is a two-dimensional scatterplot of the type summaries, with each type represented by a dot, in which an index of similarity is used to calculate the relative similarity of types to each other. Types more similar to each other are closer in space than those further away. Typically types belonging to the same system (sharing the same color dot) may be expected to be more similar to each other than types in different systems. See Appendix 1 for more details on the ordinations.

Description: A brief description of the vegetation (first paragraph) and environment (second paragraph). Common names are used for trees (see Appendix 3 for scientific name equivalents). Both common and scientific names are used for shrubs and herbs. Only scientific names are used for mosses and lichens.

Conservation Rank: A rank that summarizes the relative rarity of the association across its entire range on a scale of 1 to 5: G1 (critically imperiled), G2 (imperiled), G3 (vulnerable), G4 (apparently secure), G5 (secure). A "?" after a rank indicates the precise rank is somewhat uncertain and a range rank (G2G3) indicates a somewhat greater degree of uncertainty, whereby the type is either a G2 or G3, but not enough is known to be more specific. A "Q' indicates that the taxonomy of the type is in question, and if resolved, could result in a less imperiled rank. GW indicates a type that is semi-natural weedy and not assessed for conservation status. G? and GU indicate that the association is not yet ranked or is considered unrankable, respectively. See Grossman and others (1998) for details.

Database Code: The standard code used in the NVC and IVC databases maintained by NatureServe to identify the association.

System Name: The local system name that the type belongs with is shown above the bar on page 2 of the fact sheet. See Appendix 2 for more details on System Names.

Characteristic Species: A summary of the characteristic species (by vegetation layer) for the type, based on detailed vegetation plots (first number in parentheses). The herb layer is separated into forb and graminoid growth forms. The dwarf-shrub layer includes both short shrubs such as *Chamaedaphne calyculata* (leatherleaf) and creeping dwarf-shrubs such as *Vaccinium oxycoccus* (cranberry). Criteria for inclusion in the table include "a)" for types with five or more plots, an average frequency (constancy) across all plots of at least 60%, but if constancy is between 50 and 60%, then average cover also at least 2%; "b)" for types with five or fewer plots, an average frequency greater than 50% and cover at least 2%. The second number in parentheses gives the number of observation plots used to supplement the text description. Constancy and cover are shown for each species with constancy shown as an index (III = 50–60%, IV = 61–80%, V = 81–100%), and cover shown as average cover (i.e., V.4 means the species is found in 81–100% of the stands with an average cover of 4%). Because plot sample size (first number in parentheses) was small, the list of characteristic species is not always typical

of the type as observed in accuracy assessment observation plots (second number in parentheses). For this reason, the Description field sometimes lists additional species not shown in the Characteristic Species field.

Range: Distribution of the association within the Park and across its entire range is briefly summarized. Location maps showing the distribution of plant communities are provided in Appendix 5.

Comments: Brief comments are provided that summarize the main diagnostic features of the type, classification issues relating to this and closely related types, and, where available, the closest equivalent type reported in northwest Ontario vegetation classification publications.

Map Unit: The map unit code(s) that was assigned to the type, based on the vegetation map produced for the USGS-NPS Vegetation Mapping Program (Hop and others, 2001). The links between community types and map units are summarized in Appendix 4 (see also Hop and others, 2001, Table 5, page 46).

Minnesota State Classification 2003: The name and code used by the Minnesota DNR classification for the type (Minnesota DNR 2003).

Fact Sheets: List of Plant Communities

Numbers and Names of Associations (A-types) organized by System

System	A-type	Association (plant community type)
BOG	A1	Black Spruce Bog
	A2	Black Spruce / Leatherleaf Semi-treed Bog
	A3	Leatherleaf Bog
POOR SWAMP	A4	Black Spruce / Labrador Tea Poor Swamp
POOR FEN	A5	Tamarack Scrub Poor Fen
	A6	Leatherleaf Poor Fen
	A7	Northern Sedge Poor Fen
RICH FEN	A8	Bog Birch - Willow Shore Fen
	A9	Leatherleaf - Sweet Gale Shore Fen
	A10	Boreal Sedge Rich Fen
	A11	Wiregrass Sedge Shore Fen
RICH SWAMP	A12	White Cedar - Boreal Conifer Mesic Forest
	A13	Trembling Aspen - Balsam Poplar Lowland Forest
	A14	Black Ash - Mixed Hardwood Swamp
	A15	White Cedar - Black Ash Swamp
	A16	Black Spruce / Alder Rich Swamp
	A17	White Cedar - (Mixed Conifer) / Alder Swamp
	A18	Northern Tamarack Rich Swamp
	A19	Speckled Alder Swamp
WET MEADOW - SHRUB SWAMP	A21	Dogwood - Pussy Willow Swamp
	A22	Northern Sedge Wet Meadow
	A23	Canada Bluejoint Eastern Meadow
FRESHWATER MARSH	A24	Midwest Cattail Deep Marsh
	A25	Eastern Reed Marsh
	A26	Freshwater Bulrush Marsh
	A27	Water Horsetail - Spikerush Marsh
	A28	Wild Rice Marsh
	A29	Midwest Pondweed Submerged Aquatic Wetland
	A30	Northern Water Lily Aquatic Wetland
ROCKY OUTCROP / WOODLAND	A31	Jack Pine / Lichen Rocky Barrens
	A32	Boreal Pine Rocky Woodland
	A33	Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland

System (continued)	**A-type**	**Association (plant community type)**
	A34	Mixed Aspen Rocky Woodland
	A35	Boreal Hazelnut - Serviceberry Rocky Shrubland
	A35a	Poverty Grass Granite Barrens
NORTHERN PINE - (OAK) FOREST	A36	Red Pine / Blueberry Dry Forest
	A37	Red Pine - Aspen - Birch Forest
	A38	White Pine - Aspen - Birch Forest
	A39	White Pine / Mountain Maple Mesic Forest
JACK PINE - BLACK SPRUCE FOREST	A40	Jack Pine / Balsam Fir Forest
	A41	Jack Pine - Aspen / Bush Honeysuckle Forest
	A42	Black Spruce / Feathermoss Forest
WHITE SPRUCE - FIR FOREST	A43	Spruce - Fir / Mountain Maple Forest
	A44	Spruce - Fir - Aspen Forest
ASPEN - BIRCH FOREST	A45	Paper Birch / Fir Forest
	A46	Aspen - Birch / Boreal Conifer Forest
	A47	Aspen - Birch - Red Maple Forest
NORTHERN HARDWOODS - (CONIFER) FOREST	A48	White Cedar - Yellow Birch Forest
	A49	Northern Bur Oak Mesic Forest
Association Phases (community types)		
	CT1	Balsam Fir - Paper Birch Forest
	CT2	Black Spruce - Aspen Forest
	CT3	Bog Birch – Leatherleaf Poor Fen

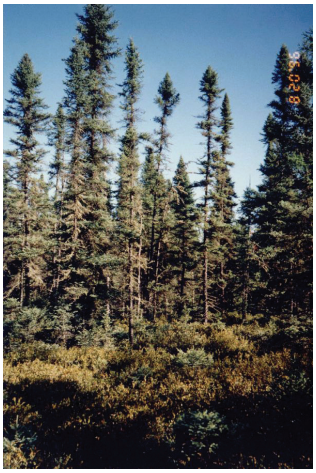
N.B. The number “A20” was skipped (see Layout and Conventions).

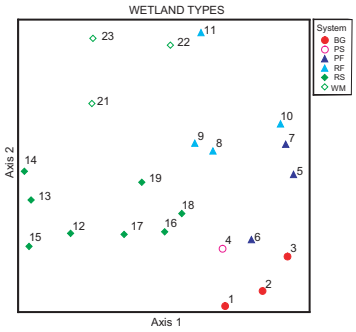
N.B. The terms Rich Fen and Rich Swamp include associations that some manuals would refer to as intermediate (or moderately rich) fens and swamps. Richness is used to describe the mineral (Ca^{++}, Mg^{++}) status of the surface water of a type relative to others. At Voyageurs, given the characteristics of the bedrock, the associations in the Rich Fen and Rich Swamp systems are more often intermediate in richness.

24

A1 Black Spruce Bog

Picea mariana / Ledum groenlandicum / Carex trisperma / Sphagnum spp. Forest





Description

This community has a variable canopy cover ranging from 25% in the woodland phases to 80% in the more closed, forested phases. Black spruce trees dominate this type and are typically 5–10 m tall in the woodland phase and 10–15 m tall in the forested phase. Tamarack trees are occasionally present. The canopy, especially in the woodland phase, tends to be uneven in size. The shrub layer is usually absent, though black spruce saplings may be present at moderate cover. In the dwarf-shrub layer, the ericaceous shrubs *Ledum groenlandicum* (labrador tea) and *Chamaedaphne calyculata* (leatherleaf) are nearly always present, but their cover is highly variable, ranging from 20 to 90%. Other ericaceous shrubs, such as *Kalmia polifolia* (bog laurel), *Andromeda glaucophylla* (bog-rosemary), and *Vaccinium oxycoccos* (small cranberry), can also be present at low cover. The herb layer is species poor, often with low cover. The most widespread herb species are *Carex trisperma* (three-fruited sedge) and *Smilacina trifolia* (three-leaved false Solomon's-seal). In some stands, the sedges *Carex chordorhiza* or *C. pauciflora* may replace *C. trisperma*. *Eriophorum spissum* (tufted cottongrass), *Drosera rotundifolia* (round-leaved sundew), and *Sarracenia purpurea* (pitcher plant) may also be present. Sphagnum typically covers nearly 100% of the ground layer. The most abundant sphagnum species are *Sphagnum magellanicum*, *S. recurvum sensu lato, and S. fuscum*.

Black Spruce Bogs are found in situations removed from ground and surface water inputs and only in the interior of large peatlands. They may be present at the crests of raised bogs and adjacent to water tracks. The substrate is deep, acidic sphagnum peat, which is mineral poor (pH usually <4.3). Hummock and hollow microtopography are moderately to well developed. The water regime is saturated.

CONSERVATION RANK G5. **DATABASE CODE** CEGL002485

CHARACTERISTIC SPECIES (n = 8, 21)

Tree

Picea mariana (black spruce) IV.35

Shrub

Picea mariana (black spruce) V.55

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) III.4, *Chamaedaphne calyculata* (leatherleaf) IV.7, *Gaultheria hispidula* (creeping snowberry) V.4, *Kalmia polifolia* (bog laurel) V.7, *Ledum groenlandicum* (labrador tea) V.25, *Vaccinium angustifolium* (lowbush blueberry) IV.4, *V. oxycoccus* (small cranberry) V.7, *V. vitis-idaea* (mountain cranberry) III.7

Forb

Monotropa uniflora (Indian pipe) IV.4, *Smilacina trifolia* (three-leaved false Solomon's-seal) V.15

Graminoid

Carex trisperma (three-fruited sedge) V.15, *Eriophorum spissum* (tufted cotton-grass) IV.7

RANGE

Voyageurs National Park

This type is found in the Rat Root River Peatland area and in the peatland complex between Black Bay and Cranberry Bay. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Bog System.

Global

This black spruce-dominated bog community type is found in the sub-boreal to boreal regions of the Great Lakes and elsewhere in the boreal region of central Canada, ranging from inland areas of Maine to northern Minnesota and northward into central Canada, including Manitoba, Ontario and Quebec.

COMMENTS

Diagnostic features include an open to closed canopy of black spruce within a large peatland, often as a raised peat bog, and a species-poor understory, with ericaceous shrubs and scattered sedges. The woodland (25–60%) and forested (60–100%) phases can be distinguished through mapping, but are floristically similar. In some cases, this community closely resembles more nutrient poor examples of the Black Spruce / Labrador Tea Poor Swamp (A4). That type will typically contain more minerotrophic indicators than this type, but heavy shading may reduce the presence of those indicators. Position on the landscape may be the best way to distinguish these types—Black Spruce Bog is found only in the interior of large peatlands whereas the Black Spruce / Labrador Tea Poor Swamp is found in confined basins, shores, and the margins of large peatlands. The A1 type is similar to Ontario's Treed Bog (W26, Harris and others, 1996).

MAP UNITS

The Black Spruce Bog (BSB) map unit represents this association. This association is mapped only in the Rat Root River Peatland bog complex and the bog complex between Black Bay and Cranberry Bay.

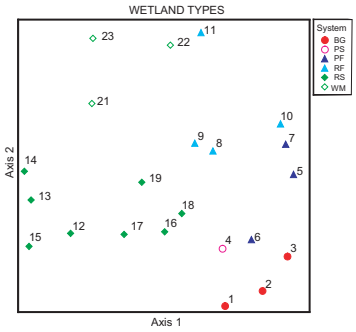
MINNESOTA STATE TYPE 2003

Black Spruce Bog, Treed Subtype (APn80a1)

26

A2 Black Spruce / Leatherleaf Semi-treed Bog

Picea mariana / Chamaedaphne calyculata / Sphagnum spp. Dwarf-shrubland



Description

Black spruce and/or tamarack are the dominant conifers in this community, though in some cases, white pine may be locally abundant. Canopy cover is 10–25% and height is usually 2–10 m tall. The ericaceous dwarf-shrub layer usually comprises 90–100% cover, and consists mainly of *Chamaedaphne calyculata* (leatherleaf), occasionally occurring with *Ledum groenlandicum* (labrador tea). Other ericaceous shrubs may also be present, including *Andromeda glaucophylla* (bog-rosemary), *Kalmia polifolia* (bog laurel), and *Vaccinium oxycoccos* (small cranberry). Herbaceous growth forms are poorly developed, with low species diversity and very sparse (<10%) cover. The more abundant species include *Smilacina trifolia* (three-leaved false Solomon's-seal), *Eriophorum spissum* (tufted cotton-grass), *Sarracenia purpurea* (pitcher plant), *Carex oligosperma* (few-seeded sedge), and *Drosera rotundifolia* (round-leaved sundew). Minerotrophic indicators are absent. *Sphagnum magellanicum*, *S. fuscum,* and *S. angustifolium* form a continuous carpet of peat moss. Typically, *S. fuscum* dominates the high hummocks, *S. magellanicum* dominates the lower and developing hummocks, and *S. angustifolium* colonizes the hollows. Other mosses such as *Aulacomnium palustre* and *Polytrichum strictum* may also be present.

This type occurs in confined basins, as part of large peatlands and as part of peatland shores. In the latter case, this type usually occurs away from the water's edge, often separated from it by a shrub bog. The substrate is deep fibric sphagnum peat, which is mineral poor (pH usually <4.3). High hummocks are often well developed whereas hollows are poorly developed. The water regime is saturated.

CONSERVATION RANK G? **DATABASE CODE** CEGL005218

CHARACTERISTIC SPECIES (n = 6, 24)

Shrub

Picea mariana (black spruce) V.55

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.2, *Chamaedaphne calyculata* (leatherleaf) V.15, *Kalmia polifolia* (bog laurel) V.7, *Ledum groenlandicum* (labrador tea) V.25, *Vaccinium oxycoccus* (small cranberry) V.4

Forb

Drosera rotundifolia (round-leaved sundew) V.1, *Sarracenia purpurea* (pitcher-plant) V.2 *Smilacina trifolia* (three-leaved false Solomon's-seal) IV.25

Graminoid

Carex pauciflora (few-flowered sedge) V.25, *Eriophorum spissum* (tufted cotton-grass) V.15

RANGE

Voyageurs National Park

This type occurs primarily in the Rat Root River Peatland, with scattered occurrences elsewhere. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Bog System.

Global

This community is found in the sub-boreal regions of the Great Lakes in the United States and is widespread in central Canada.

COMMENTS

Diagnostic features of the type are the dwarf-shrub layer dominated by *Chamaedaphne calyculata* (leatherleaf) with 10–25% cover of conifers (typically black spruce and/or tamarack). This type differs from the Leatherleaf Bog (A3) primarily in the density of conifers, where that type has <10% tree cover. In large peatlands (such as Rat Root River Peatland), this community can grade into the woodland phase of the Black Spruce Bog (A1). The A2 type is similar to Ontario's Semi-treed Bog (W25, Harris and others, 1996).

MAP UNITS

The Black Spruce/Leatherleaf Semi-treed Bog (LBC) map unit represents this association and the Leatherleaf Bog association (A3), which occur in close juxtaposition in the Rat Root River Peatland bog complex. (Veg Map Adjustment: See Appendix 4.)

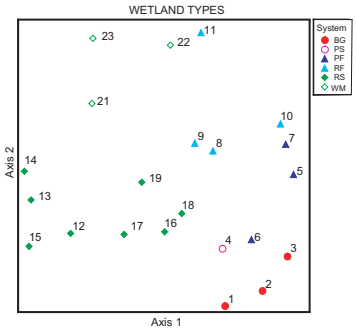
MINNESOTA STATE TYPE 2003

Black Spruce Bog, Semi-Treed Subtype (APn80a2)

28

A3 Leatherleaf Bog

Chamaedaphne calyculata - Ledum groenlandicum - Kalmia polifolia Bog Dwarf-shrubland



Description

The vegetation is dominated by an open dwarf-shrub/scrub conifer layer with very scattered trees (<10% cover). Microtopography is high hummocks with weakly developed hollows. Ericaceous dwarf-shrubs are dominant, including *Chamaedaphne calyculata* (leatherleaf), *Kalmia polifolia* (bog laurel), *Andromeda glaucophylla* (bog-rosemary), *Ledum groenlandicum* (labrador tea), and the creeping dwarf-shrub *Vaccinium oxycoccos* (small cranberry). Scrub conifers include tamarack and black spruce. The herb layer is species poor, containing *Carex oligosperma* (few-seeded sedge), *C. pauciflora* (few-flowered sedge), *Eriophorum spissum* (tufted cotton grass) and *Sarracenia purpurea* (pitcher plant). The moss layer forms a continuous hummocky mat dominated by sphagnum, including *Sphagnum angustifolium, S. fuscum*, and *S. magellanicum.*

Sites are found on raised bog landforms in large peatland complexes, basin bogs, and occasionally oligotrophic shores. Stands have a saturated hydrology with a deep fibric sphagnum peat soil and a pH usually <4.3.

CONSERVATION RANK G5

DATABASE CODE CEGL005278
Old Code CEGL002498

CHARACTERISTIC SPECIES (n = 1, 30)

Shrub

Larix laricina (tamarack) V.4, *Picea mariana* (black spruce) V.35

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.4, *Chamaedaphne calyculata* (leatherleaf) V.85, *Kalmia polifolia* (bog laurel) V.4, *Ledum groenlandicum* (labrador tea) V.4, *Vaccinium oxycoccus* (small cranberry) V.15

Herb

Drosera rotundifolia (round-leaved sundew) V.4, *Sarracenia purpurea* (pitcher-plant) V.4

Graminoid

Eriophorum spissum (tufted cotton-grass) V.4

RANGE

Voyageurs National Park

This type occurs in the large peatlands in and near the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Bog System.

Global

This bog community is found in the sub-boreal regions of the Great Lakes in the United States and is widespread in central Canada.

COMMENTS

Diagnostic features of this type include the dominance of a dwarf-shrub ericaceous layer, absence of a tree layer (<10%), species-poor herb layer, and almost complete lack of minerotrophic indicators, such as *Betula glandulifera* (bog-birch), *Carex aquatilis* (water sedge), and *C. stricta* (tussock-sedge). It is typically found in larger raised bog peatlands. A possible subtype may occur in which pools form near the bogs crests, and contain species such as *Scheuchzeria palustris* (scheuchzeria), *Rhynchospora alba* (white beaked-sedge), *Sphagnum cuspidatum* (sphagnum), and *Utricularia cornuta* (horned bladderwort).

Stands with 10–25% black spruce and tamarack cover are placed in the Black Spruce / Leatherleaf Semi-treed Bog (A2). Stands with sufficient minerotrophic indicators are placed in the wetter Leatherleaf Poor Fen (A6). The A3 type is similar to Ontario's Open Low Shrub Bog (W24; Harris and others, 1996).

At the time of the vegetation mapping project, this type and Leatherleaf Poor Fen (A6) were not recognized as distinct. The old database code was used for the original broad type-concept.

MAP UNITS

The Leatherleaf Bog (LBC) map unit represents this association and the Black Spruce / Leatherleaf Semi-Treed Bog association (A2), which occur in close together in the Rat Root River Peatland bog complex. (Veg Map Adjustment: See Appendix 4.)

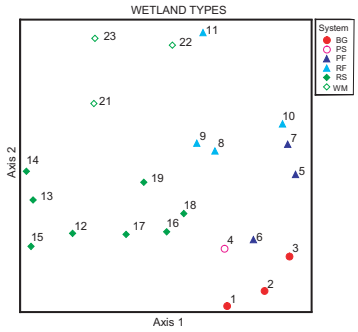
MINNESOTA STATE TYPE 2003

Low Shrub Bog, Typic Subtype (APn90b1)

30

A4 Black Spruce / Labrador Tea Poor Swamp

Picea mariana / Ledum groenlandicum / Sphagnum spp. Forest



Description

Black spruce trees dominate this type, and are typically 10–20 m tall in the forested stands and 5–10 m tall in the woodland stands. Scattered tamarack trees are occasional codominants (25% cover). The shrub layer is usually absent, though black spruce saplings may be present at low cover, as can *Alnus incana* (speckled alder) or *Betula glandulifera* (bog-birch). The dwarf-shrubs *Ledum groenlandicum* (labrador tea) and *Chamaedaphne calyculata* (leatherleaf) are nearly always present, but cover is highly variable, ranging from 20 to 90%, with higher cover more common in the open stands. Other ericaceous dwarf-shrubs such as *Kalmia polifolia* (bog laurel), *Andromeda glaucophylla* (bog-rosemary), and *Vaccinium oxycoccos* (small cranberry) may also be present. The herb layer is species poor and present at low density, usually <40% cover. The most widespread species are *Carex trisperma* and *Smilacina trifolia* (three-leaved false Solomon's-seal). Scattered minerotrophic species may also be present, most commonly *Carex lacustris* and *Iris versicolor,* but occasionally *Menyanthes trifolia, Carex paupercula, Calamagrostis canadensis, Carex leptalea, Rubus pubescens,* and *Potentilla palustris*. Sphagnum typically covers nearly 100% of the forest floor. The most abundant species are *Sphagnum magellanicum, S. recurvum sensu lato, S. capillifolium,* and *S. russowii. Calliergon cordifolium* and/or *C. giganteum* may colonize the wet hollows.

This type is found in confined peatland basins, on the upland margins of large peatlands, in poorly drained depressions in bedrock, and removed from the water's edge on peatland shorelines. The substrate is deep, acidic sphagnum peat that is mineral poor. Hummock and hollow microtopography is moderately to well developed. The water regime is saturated.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002454

CHARACTERISTIC SPECIES (n = 7, 84)

Tree

Picea mariana (black spruce) IV.15

Shrub

Betula glandulifera (bog-birch) IV.7, *Larix laricina* (tamarack) III.15, *Picea mariana* (black spruce) V.35

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) IV.15, *Chamaedaphne calyculata* (leatherleaf) V.15, *Kalmia polifolia* (bog laurel) V.7, *Ledum groenlandicum* (labrador tea) V.35, *Vaccinium oxycoccus* (small cranberry) IV.4

Forb

Smilacina trifolia (three-leaved false Solomon's-seal) IV.4

Graminoid

Carex chordorrhiza (creeping sedge) IV.15, *C. paupercula* (poor sedge) IV.4, *C. trisperma* (three-fruited sedge) V.7

RANGE

Voyageurs National Park

Though this type can be found throughout the Park, it is most common in the northern parts of the Park where peatlands are more extensive. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Poor Swamp and Poor Fen Systems.

Global

This community is found in the northern Great Lakes region of the United States and Canada and elsewhere in the boreal regions of central Canada, ranging from northern Michigan to northern Minnesota, and northward to parts of Manitoba, Ontario and probably Quebec.

COMMENTS

Diagnostic features of the type are a forested or woodland canopy of black spruce with or without tamarack. In some cases, this community closely resembles more nutrient poor examples of the Black Spruce Bog (A1). This type will generally contain more minerotrophic indicators than that type. Position on the landscape, however, is the best way to distinguish these types. The Black Spruce Bog is found only in the interior of large peatlands whereas this type is found in confined basins, shores, and the margins of large peatlands. Where tamarack trees exceed 75%, stands should be placed in the Northern Tamarack Rich Swamp (A18). The A4 type is similar to Ontario's W27 and W28 (Harris and others, 1996).

MAP UNITS

Three map units represent three structural phases of this one association: the Black Spruce/Labrador Tea Poor Swamp (evergreen phase) (BSL), the Black Spruce/Labrador Tea Poor Swamp (mixed phase) (BST), and the Black Spruce/Labrador Tea Open Swamp (open canopy phase) (BSO). The BSO portion of this association is also mapped as part of the Beaver Basin Break-up Mosaic (BBX) map unit when it occurs in inundated beaver complexes. (Veg Map Adjustment: See Appendix 4.)

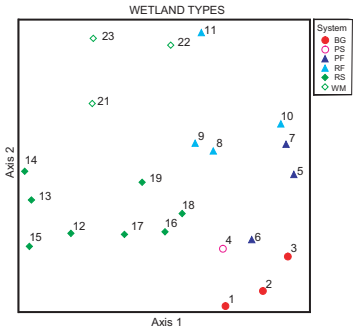
MINNESOTA STATE TYPE 2003

Poor Black Spruce Swamp (APn81a)

32

A5 Tamarack Scrub Poor Fen

Larix laricina - Betula pumila / Chamaedaphne calyculata Shrubland



Description

This community is a low shrub poor fen where tree height does not exceed 2 m and the overall appearance may sometimes be of a very open tamarack scrub. Tamarack dominates the shrub layer, with occasional black spruce, along with shorter stems of *Betula glandulifera* (bog-birch). C*hamaedaphne calyculata* (leatherleaf), and *Andromeda glaucophylla* (bog-rosemary) are common dwarf-shrub species. Herbaceous species include the sedges *Carex chordorrhiza* (creeping sedge) and *C. lasiocarpa* (wire-sedge).

Stands occur in peatlands with low exposure to mineral-rich groundwater, including in basins, shores above the level of seasonal flooding and on the margins of water tracks.

CONSERVATION RANK ND **DATABASE CODE** CEGL005226

CHARACTERISTIC SPECIES (n = 1, 5)

Shrub

Betula glandulifera (bog-birch) V.65, *Larix laricina* (tamarack) V.85, *Salix pedicellaris* (bog willow) V.4

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.15, *Chamaedaphne calyculata* (leatherleaf) V.15, *Vaccinium oxycoccus* (small cranberry) V.4

Forb

Lysimachia thyrsiflora (tufted loosestrife) V.15, *Potentilla palustris* (marsh cinquefoil) V.4

Graminoid

Carex chordorrhiza (creeping sedge) V.15, *C. lasiocarpa* (wire-sedge) V.4

RANGE

Voyageurs National Park

This type is rare in the Park, where it occurs only in the Rat Root River Peatland. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Poor Swamp and Poor Fen Systems.

Global

This tamarack low shrub poor fen is found in the northern Great Lakes region of the United States and into central Canada, ranging from Minnesota into Ontario and elsewhere in Canada.

COMMENTS

Stands occur on mineral-poor peatlands, generally having few minerotrophic indicators, but having greater cover of tamarack than similar scrubby poor fens dominated by *Chamaedaphne calyculata* (leatherleaf), such as Leatherleaf Poor Fen (A6). But this type and A6 are otherwise similar. It can be difficult to resolve how much of the tamarack is scrub (<2–5 m tall) versus tree (>5 m tall) from an aerial versus ground perspective. The wetter phase of this type occurs in the water tracks, is more clearly graminoid-dominated, and often contains standing water in the hollows. These stands grade into the sedge-dominated Northern Sedge Poor Fen (A7). The A5 type is similar to Ontario's W22 (Harris and others, 1996), especially in scrub cover, though it also shows strong floristic similarities to W20 and W21.

MAP UNITS

The Tamarack Scrub Poor Fen (TF) map unit represents this association. This association is mapped only in the Rat Root River Peatland bog complex.

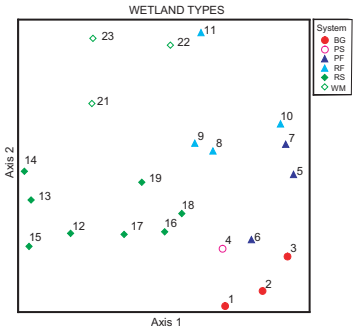
MINNESOTA STATE TYPE 2003

Low Shrub Poor Fen [tamarack phase] (APn91ax2)

34

A6 Leatherleaf Poor Fen

Chamaedaphne calyculata / Carex oligosperma / Sphagnum spp. Poor Fen Dwarf-shrubland



Description

The vegetation is dominated by an open dwarf-shrub/scrub conifer layer with very scattered trees (<10% cover). Microtopography consists of high to intermediate hummocks with hollows or a flat lawn of *Sphagnum* spp. Ericaceous dwarf-shrubs are dominant, especially *Chamaedaphne calyculata* (leatherleaf), with *Betula glandulifera* (bog-birch), *Kalmia polifolia* (bog laurel), *Ledum groenlandicum* (labrador tea), *Andromeda glaucophylla* (bog-rosemary), and *Vaccinium oxycoccos* (small cranberry) common. Scrub conifers include tamarack and black spruce. They also occur as scattered trees (>3 m). The herb layer is species-poor, containing *Carex oligosperma* (few-seeded sedge), *Eriophorum spissum* (tufted cotton-grass), and *Equisetum fluviatile* (water horsetail), with occasional *Menyanthes trifoliata* (buckbean), *Sarracenia purpurea* (pitcher-plant), and *Drosera rotundifolia* (round-leaved sundew). The moss layer forms a continuous hummocky mat dominated by *Sphagnum angustifolium*, *S. fuscum*, and *S. magellanicum*.

Sites are found on peatlands with low exposure to mineral-rich groundwater, including basin fens, shores above the level of seasonal flooding, and margins of larger peatlands. Stands have a saturated hydrology with a fibric sphagnum peat soil and a pH usually <4.5.

CONSERVATION RANK G5 **DATABASE CODE** CEGL005277

CHARACTERISTIC SPECIES (n = 7, 4)

Shrub

Betula glandulifera (bog-birch) III.15, *Picea mariana* (black spruce) IV.15

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) III.4, *Chamaedaphne calyculata* (leatherleaf) V.75, *Kalmia polifolia* (bog laurel) V.4, *Ledum groenlandicum* (labrador tea) III.7, *Vaccinium oxycoccus* (small cranberry) V.15

Forb

Drosera rotundifolia (round-leaved sundew) V.2*, Smilacina trifolia* (three-leaved false Solomon's-seal) IV.7

Graminoid

Eriophorum spissum (tufted cotton-grass) III.15

RANGE

Voyageurs National Park

Though this type can be found throughout the Park, it is most common in the northern parts of the Park where peatlands are more extensive. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Poor Swamp and Poor Fen Systems.

Global

This dwarf-shrub poor fen community is found in the northern Great Lakes region and northeastern United States and across much of central Canada, ranging from probably Maine and New Hampshire west to Minnesota, and northward from Quebec to Manitoba and other parts of Canada.

COMMENTS

It is difficult to distinguish this leatherleaf poor fen from leatherleaf bogs in the field, but conceptually this type has somewhat more minerotrophic influence, and no scrub conifer component. When minerotrophic indicators are absent or "very low," stands are placed in Leatherleaf Bog (A3). Stands with sparse black spruce-tamarack tree layer (<10% tree cover), but a scrubby conifer layer are placed in Tamarack Scrub Poor Fen (A5). There are intermediates between this poor fen and sedge meadows, such as when *Sphagnum* spp. and *Chamaedaphne calyculata* (leatherleaf) have invaded a *Carex rostrata* (beaked sedge) meadow and the sedge is hanging on because it still has deep rooting in the underlying minerotrophic peat or mineral soil (N. Aaseng pers. comm. 2000). At the time of the vegetation mapping project, this type and A3 were not recognized as distinct. The A6 type is similar to Ontario Poor Fen types W20 andW21 (Harris and others, 1996).

MAP UNITS

The Leatherleaf Poor Fen (LPF) map unit represents this association. This association is also mapped as part of the Beaver Basin Break-up Mosaic (BBX) map unit when it occurs in inundated beaver complexes. (Veg Map Adjustment: See Appendix 4.)

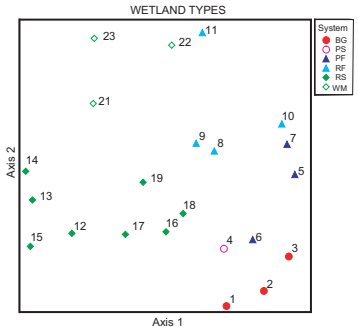
MINNESOTA STATE TYPE 2003

Low Shrub Poor Fen [leatherleaf phase] (APn91ax1)

36

A7 Northern Sedge Poor Fen

Carex lasiocarpa - C. oligosperma / Sphagnum spp. - *Polytrichum* spp. Herbaceous vegetation



Description

This community is dominated by 80–100% cover of *Carex lasiocarpa* (wire-sedge). Short, stunted tamarack trees, usually under 2 m tall, are present above the herb layer at <10% cover. Dwarf-shrubs, most commonly *Chamaedaphne calyculata* (leatherleaf) and *Andromeda glaucophylla* (bog-rosemary), may be present at <40% cover and, in wetter stands, occupy only the drier hummocks. The shrubs *Kalmia polifolia* (bog laurel), *Betula glandulifera* (bog-birch), and *Vaccinium oxyccocus* (small cranberry) may also be present at low density. In addition to *Carex lasiocarpa* (wire-sedge), other common herbs include *Menyanthes trifolia* (buckbean), *Equisetum fluviatile* (water horsetail), *Drosera rotundifolia* (round-leaved sundew), and *Sarricenia purpurea* (pitcher-plant). Stands of this type occurring in water tracks tend to be more mineral rich and may also contain *Pogonia ophioglosoides, Carex limosa,* and *Utricularia intermedia*. Sphagnum typically forms a continuous carpet, though in wetter stands may be intermixed with brown mosses. The most abundant species are *Sphagnum megellanicum, S. angustifolium, S. subsecundum sensu lato,* and *Warnstorfii exanulata*.

The Northern Sedge Poor Fen occurs in and around water tracks of large peatlands. In the wetter, more minerotrophic phase, microtopography consists of wet hollows with scattered hummocks. In the drier phase, hummock and hollow microtopography is more well developed. The substrate is deep, fibric Sphagnum peat. The water regime is saturated.

CONSERVATION RANK G3G4 **DATABASE CODE** CEGL002265

CHARACTERISTIC SPECIES (n = 5, 8)

Shrub

Betula glandulifera (bog-birch) V.2, *Larix laricina* (tamarack) V.7, *Picea mariana* (black spruce) V.2

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.15, *Chamaedaphne calyculata* (leatherleaf) V.15, *Kalmia polifolia* (bog laurel) V.7, *Ledum groenlandicum* (labrador tea) V.2, *Vaccinium oxycoccus* (small cranberry) V.7

Forb

Equisetum fluviatile (water horsetail) V.1, *Menyanthes trifoliata* (buckbean) IV.7, *Sarracenia purpurea* (pitcher-plant) V.2

Graminoid

Carex lasiocarpa (wire-sedge) V.65

RANGE

Voyageurs National Park

This community type occurs in and around water tracks of the Rat Root River Peatland. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Poor Swamp and Poor Fen Systems.

Global

This graminoid poor fen community is found in the Great Lakes region of the United States and Canada, as well as elsewhere in central Canada, from Ontario to Manitoba, south to Iowa, and east to Illinois.

COMMENTS

Diagnostic features of the type include the continuous cover of *Carex lasiocarpa* (wire-sedge), low coverage of tamarack (<10%), and acidic shrubs. The wetter phase of this type occurs in the water tracks and often contains standing water in the hollows. The drier phase usually lacks standing water, has greater cover of tamarack, and has a more well developed scrub layer. These drier phases can grade into the Tamarack Scrub Poor Fen (A5). This type differs from the Wiregrass Sedge Shore Fen (A11), which is also dominated by *Carex lasiocarpa* (wire-sedge), by being seasonally flooded and lacking acidic peatland indicators. A11 is also absent from the Rat Root River Peatland. The A7 type is most similar to Ontario's W20, but also has some similarities to W19, when found within the wetter water tracks (Harris and others, 1996).

MAP UNITS

The Northern Sedge Poor Fen (SPF) map unit represents this association and the Boreal Sedge Rich Fen association (A10), which occur in close juxtaposition in the Rat Root River Peatland bog complex. (Veg Map Adjustment: See Appendix 4.)

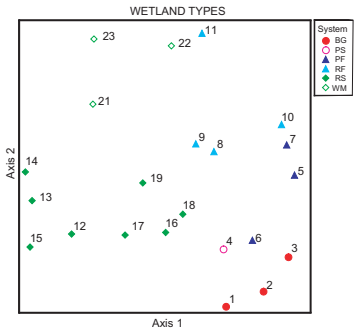
MINNESOTA STATE TYPE 2003

Graminoid Poor Fen (Basin) (APn91b)

38

A8 Bog Birch - Willow Shore Fen

Alnus incana - *Salix* spp. - *Betula pumila* / *Chamaedaphne calyculata* Shrubland



Description

This shrub fen community contains a tall shrub layer dominated by *Betula glandulifera* (bog-birch); however, *Alnus incana* (speckled alder), *Salix pyrifolia* (balsam willow), *S. pedicellaris* (bog willow), and *S. petiolaris* (meadow willow) are also commonly present, usually at lower cover. Shrubs are usually under 2 m tall and coverage ranges from 30 to 90%. The dwarf-shrub layer cover is often open and may contain *Chamaedaphne calyculata* (leatherleaf), *Ledum groenlandicum* (labrador tea), *Andromeda glaucophylla* (bog-rosemary), and *Kalmia polifolia* (bog laurel). The high density of shrub cover may create a sparse herb layer. The most abundant species are *Carex aquatilis* (water sedge), *C. lacustris* (lake-sedge), and *Smilacina trifolia* (three-leaved false Solomon's-seal), with occasional *Calamagrostis canadensis* (bluejoint) and *Potentilla palustris* (marsh cinequefoil). The moss-lichen layer is dominated by *Sphagnum magellanicum, S. angustifolium, S. centrale, S. girgensohnii*, and *S. fallax*. These species typically comprise 90–100% cover.

This type is most commonly found along the minerotrophic margins of confined basin peatlands, or associated with peatland lake shore complexes, where water levels fluctuate. The substrate is deep fibric, sphagnum peat. The water regime is saturated or, rarely, seasonally flooded. Hummock and hollow microtopography is well developed.

CONSERVATION RANK G?

DATABASE CODE CEGL005227

CHARACTERISTIC SPECIES (n = 2, 21)

Shrub

Alnus incana (speckled alder) V.7, *Betula glandulifera* (bog-birch) V.85, *Pinus strobus* (white pine) V.1, *Salix pedicellaris* (bog willow) V.4, *S. petiolaris* (meadow willow) III.7, *S. pyrifolia* (balsam willow) V.7

Dwarf-shrub

Chamaedaphne calyculata (leatherleaf) V.35

Forb

Potentilla palustris (marsh cinquefoil) V.2

Graminoid

Calamagrostis canadensis (bluejoint) V.7, *Carex aquatilis* (water sedge) III.15, *C. lacustris* (lake-sedge) V.7

RANGE

Voyageurs National Park

This type is found primarily in the northern sections of the Park in association with peatland areas along lake margins. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Fen System.

Global

This shrub shore fen is found in the northern Great Lakes region of the United States and Canada.

COMMENTS

Diagnostic features of the type include a tall shrub layer dominated by *Betula glandulifera* (bog-birch), with *Alnus incana* (speckled alder) and *Salix* spp. (willow) consistent at low cover. An ericaceous dwarf-shrub mix is usually present, but more strongly dominated ericaceous stands are placed in the Leatherleaf - Sweet Gale Shore Fen (A9). When *Salix* spp. or *Alnus incana* increase in cover, this community can grade into either the Speckled Alder Swamp (A19) or the Dogwood - Pussy Willow Swamp (A21), but both of those types typically lack bog species indicators or a prominent peat layer, and are more often found in shoreline situations. The A8 type is similar to Ontario's W16 (Harris and others, 1996).

MAP UNITS

The Bog Birch-Willow Shore Fen (BBSF) map unit represents this association.

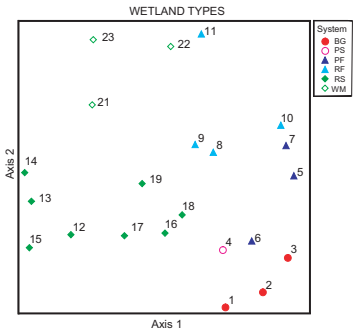
MINNESOTA STATE TYPE 2003

Bog Birch - Alder Shore Fen (OPn81a)

40

A9 Leatherleaf - Sweet Gale Shore Fen

Chamaedaphne calyculata - Myrica gale / Carex lasiocarpa Dwarf-shrubland



Description

This community contains a shrub layer of low to moderate cover, with *Betula glandulifera* (bog-birch), *Alnus incana* (speckled alder), *Salix pyrifolia* (balsam willow), and *S. pedicellaris* (bog willow), the most abundant shrubs. *Chamaedaphne calyculata* (leatherleaf) is usually present at 70–90% cover but may be mixed with lesser amounts of the dwarf-shrubs *Andromeda glaucophylla* (bog-rosemary) and *Vaccinium oxycoccos* (small cranberry). *Myrica gale* (sweet gale) is not common in stands in the Park. In addition to bog plants, such as *Drosera rotundifolia* (round-leaved sundew), other minerotrophic indicators present include *Carex lacustris* (lake sedge), *C. lasiocarpa* (wire-sedge), *Equisetum fluviatile* (water horsetail), *Calamagrostis canadensis* (bluejoint), and *Potentilla palustris* (marsh cinequefoil). Occasionally, herbaceous cover may reach 90%. A continuous carpet of peat moss includes species such as *Sphagnum magellanicum, S. recurvum sensu stricta, S. angustifolium,* and *S. subsecundum sensu lato*.

This type occupies peatland sites that border lakes and are influenced by fluctuating water levels. Sites can occur right up to the water's edge or be separated from the water by another community, typically a shallow marsh. When they exist up to the water's edge, the peat may be floating or be grounded nearer to shore. Hummock and hollow microtopography is usually well developed, with standing water sometimes present in the hollows. Substrate is deep, fibric, sphagnum peat. The water regime is seasonally flooded to saturated.

CONSERVATION RANK G?

DATABASE CODE CEGL005228

CHARACTERISTIC SPECIES (n = 10, 23)

Shrub

Alnus incana (speckled alder) V.7, *Betula glandulifera* (bog-birch) IV.15, *Picea mariana* (black spruce) IV.2, *Pinus strobus* (white pine) IV.2, *Salix pedicellaris* (bog willow) III.4, *Salix pyrifolia* (balsam willow) IV.2

Dwarf-shrub

Chamaedaphne calyculata (leatherleaf) V.75, *Vaccinium oxycoccus* (small cranberry) V.7

Forb

Drosera rotundifolia (round-leaved sundew) IV.2, *Equisetum fluviatile* (water horsetail) IV.7, *Potentilla palustris* (marsh cinquefoil) IV.2

Graminoid

Calamagrostis canadensis (bluejoint) IV.15, *Carex lacustris* (lake-sedge) IV.4

RANGE

Voyageurs National Park

This type is localized in areas around the larger lakes in the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Fen System.

Global

This community is typically found on floating mats on the edges of lakes and streams in the Great Lakes region of the United States and Canada. It ranges from northern Minnesota and adjacent Ontario eastward to localized areas of Michigan and New York. In New York, one site (Deer Creek) is known along the shores of eastern Lake Ontario.

COMMENTS

Diagnostic features of the type include the high cover of *Chamaedaphne calyculata* (leatherleaf) with one or more of the following minerotrophic species present: *Myrica gale (sweet gale), Betula glandulifera* (bog-birch), *Salix* spp. (willow), *Carex lacustris, C. lasiocarpa* (wire-sedge), *Calamagrostis canadensis* (bluejoint), and *Equisetum fluviatile* (water horsetail). This type differs from the Leatherleaf Poor Fen (A6) in having a shrub layer of minerotrophic species. When cover of *Betula glandulifera* and *Salix* spp. (willow) increases, this community can grade into a Bog Birch - Willow Shore Fen (A8) or a Dogwood - Pussy Willow swamp (A21), and >25% cover of those shrubs would warrant placing the stand into one of these other communities. The A9 type is similar to Ontario's W15 (Harris and others, 1996).

MAP UNITS

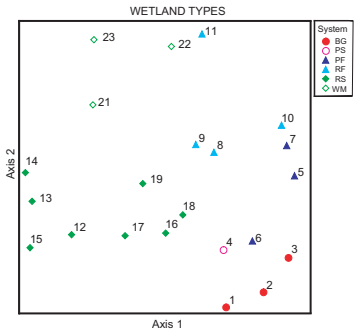
The Leatherleaf-Sweet Gale Shore Fen (LSF) map unit represents this association. This association is also mapped as part of the Beaver Basin Break-up Mosaic (BBX) map unit when it occurs in inundated beaver complexes.

MINNESOTA STATE TYPE 2003

Leatherleaf - Sweet Gale Shore Fen (OPn81b)

A10 Boreal Sedge Rich Fen

Carex lasiocarpa - Carex buxbaumii - Trichophorum caespitosum Boreal Herbaceous Vegetation



Description

Vegetation is typically dominated by graminoids and *Sphagnum* spp. with low cover of ericaceous dwarf-shrubs on the hummocks and a very scattered tree layer of black spruce, tamarack, and occasional white-cedar. Microtopography can consist of wet hollows with scattered low to intermediate hummocks. The graminoid layer is dominated by *Carex lasiocarpa* (wire sedge), *Rhynchospora alba* (white beakrush), and *C. livida* (livid sedge). The ericaceous shrubs include *Andromeda glaucophylla* (bog rosemary), *Betula glandulifera* (bog birch), and occasional *Chamaedaphne calyculata* (leatherleaf). Mosses include the brown mosses, such as *Campylium stellatum*.

Stands are found in peatlands where flarks form in the interior of well-developed featureless water tracks in larger peatlands. Substrate is saturated fibric to mesic peat.

*Photograph courtesy of Minnesota Department of Natural Resources.

CHARACTERISTIC SPECIES (n = 1, 0)

Tree

Betula glandulifera (bog-birch) V.15

Shrub

Larix laricina (tamarack) V.15

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.15

Graminoid

Carex lasiocarpa (wire-sedge) V.85

RANGE

Voyageurs National Park

This type is very localized in the Park, occurring in richer water tracks of the Rat Root River Peatland. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Fen System.

Global

This rich graminoid fen type is found in the northern Great Lakes region of the United States and Canada, and elsewhere in central Canada.

COMMENTS

At the time of the vegetation mapping project, this type was not initially recognized, but is now understood as rare in the Park. The description is supplemented from observations elsewhere in northern Minnseota. Diagnostic features of this type include the continuous cover of *Carex lasiocarpa* (wire-sedge) and low coverage of tamarack (<10%). This type differs from the Wiregrass Sedge Shore Fen (A11), also dominated by *C. lasiocarpa* (wire-sedge), but lacks the species more tolerant of seasonal flooding found in the A11 type. This community is also similar to the Northern Sedge Poor Fen (A7) in that both are dominated by *C. lasiocarpa* (wire-sedge), but that community has a significant cover of *Sphagnum* spp. and *Chamaedaphne calyculata* (leatherleaf), whereas this community has a moderate number of minerotrophic indicators. The A10 type is most similar to Ontario's W19 (Harris and others, 1996).

MAP UNITS

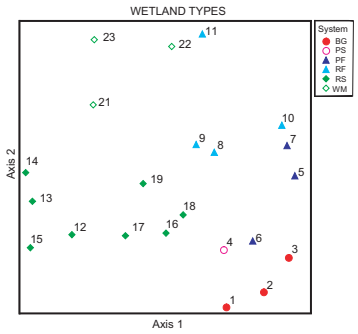
The Northern Sedge Poor Fen (SPF) map unit represents this association and the Northern Sedge Poor Fen association (A7), which occur in close juxtaposition in the Rat Root River Peatland bog complex. (Veg Map Adjustment: See Appendix 4.)

MINNESOTA STATE TYPE 2003

Graminoid Rich Fen (Water Track) Flark Subtype (OPn91b2)

A11 Wiregrass Sedge Shore Fen

Carex lasiocarpa - (Carex rostrata) - Equisetum fluviatile Herbaceous Vegetation



Description

This community is characterized by a continuous cover of *Carex lasiocarpa* (wire-sedge). It is typically species poor, with some stands harboring as few as four species. Along with *Carex lasiocarpa* (wire-sedge), *Equisetum fluviatile* (water horsetail) and *C. rostrata (=utriculata)* (beaked sedge) can be found at moderate cover. The following herbs are also common, but usually exist at low cover: *Acorus calamus* (sweet flag), *Polygonum amphibium* (water smartweed), *Potentilla palustris* (marsh cinquefoil), and *Utricularia intermedia* (flat-leaved bladderwort). Few, scattered shrubs of *Chamaedaphne calyculata* (leatherleaf) may be present. The moss, *Warnstorfia exannulata* is also frequent in standing water in this community, though at low density.

Stands occur on floating or grounded peat mats near the shores of the large lakes. The peat is commonly a fibric sedge peat, though fibric sphagnum peat can occasionally be found in layers below the sedge peat. Standing water 20–50 cm deep is usually present throughout the year in these stands. Most of these stands are located in areas sheltered from extreme wave action and have very little microtopography. The water regime is permanently flooded to intermittently exposed.

CONSERVATION RANK G? **DATABASE CODE** CEGL005229

CHARACTERISTIC SPECIES (n = 4, 4)

Forb

Acorus calamus (sweet flag) IV.7, *Equisetum fluviatile* (water horsetail) V.25, *Polygonum amphibium* (water smartweed) III.4, *Potentilla palustris* (marsh cinquefoil) IV.7, *Utricularia intermedia* (flat-leaved bladderwort) IV.7

Graminoid

Carex lasiocarpa (wire-sedge) V.75, *Carex rostrata* (beaked sedge) III.4

RANGE

Voyageurs National Park

This type typically occurs along shores around larger lakes. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Fen System.

Global

This rich graminoid fen type is found in the northern Great Lakes region of the United States and Canada, ranging from Minnesota east to Michigan and northward into Ontario and probably other parts of central Canada.

COMMENTS

Diagnostic features of the type include an herb layer with >70% cover of *Carex lasiocarpa* (wire-sedge). Overall, this community is most similar to the Northern Sedge Wet Meadow (A22) but can easily be distinguished by its dominance of *Carex lasiocarpa* (wire-sedge) and its restriction to the shores of the large lakes. This type differs from the Boreal Sedge Rich Fen (A10), also dominated by *C. lasiocarpa* (wire-sedge), in that it contains species more tolerant of seasonal flooding. This community differs from the Northern Sedge Poor Fen (A7), which is also dominated by *C. lasiocarpa* (wire-sedge), in lacking acidic indicators found in A7, such as *Sphagnum* spp. and *Chamaedaphne calyculata* (leatherleaf). The A7 type is also only found in the Rat Root River Peatland. The A11 type is similar to Ontario's W14 (Harris and others, 1996).

MAP UNITS

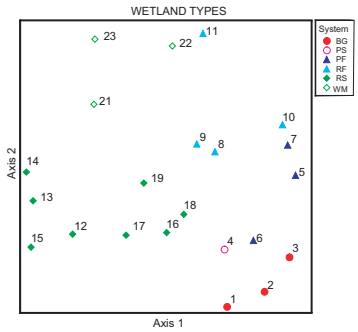
This association is represented with the Wet Meadow/Fen Mosaic/Complex (SMX) map unit, which also includes other associations.

MINNESOTA STATE TYPE 2003

Graminoid Rich Fen (Basin) (OPn92a)

A12 White Cedar - Boreal Conifer Mesic Forest

Thuja occidentalis / Abies balsamea - Acer spicatum Forest



Description

This community generally exhibits a completely closed canopy of white-cedar (90–100% cover), though some stands may be as low as 60%. Black ash and, less commonly, balsam poplar and trembling aspen can also occur in the tree layers at <25% cover. There is no subcanopy, but occasionally a tall shrub layer with about 25% cover of balsam fir and mountain-maple. The cover of herbaceous species is highly variable, ranging from 10 to 90%, and diverse. Common forbs include *Aralia nudicaulis* (wild sarsaparilla), *Athyrium angustum* (lady-fern), *Clintonia borealis* (bluebead lily), *Cornus canadensis* (bunchberry), *Galium triflorum* (three-flowered bedstraw), *Gymnocarpium dryopteris* (common oak-fern), *Maianthemum canadense* (Canada mayflower), *Mitella nuda* (naked miterwort), *Rubus pubescens* (dwarf raspberry), and *Trientalis borealis* (starflower). The dominant bryophytes are *Rhytidiadelphus triquetrus, Climacium dendroides, Calliergon cordifolium, C. giganteum,* and mosses in the Mniaceae (*Mnium* spp.) family. The cover of the moss-lichen layer can range from very sparse to about 40% cover.

In the southwest part of the Park, this type usually occurs on flat terrain over deep, poorly drained silt clay loams. In the rest of the Park, this community is commonly found on gently sloping terrain, often on toeslopes, located on the upland-wetland interface. There is usually very little surficial bedrock. The soils are typically 7–10 cm loams over dense lacustrine clay. In some cases, a shallow build up of well decomposed peat may be present. Hummocks and hollows formed from fallen trees and build up of organic debris may be absent or well developed.

CHARACTERISTIC SPECIES (n = 10, 30)

Tree

Fraxinus nigra (black ash) III.15, *Thuja occidentalis* (white-cedar) V.55

Shrub

Abies balsamea (balsam fir) V.2, *Acer spicatum* (mountain maple) III.7, *Amelanchier* spp. (serviceberry) V.1, *Betula papyrifera* (paper birch) IV.4, *Cornus rugosa* (round-leaved dogwood) IV.4, *Corylus cornuta* (beaked hazelnut) IV.2, *Fraxinus nigra* (black ash) V.15, *Thuja occidentalis* (white-cedar) V.25

Dwarf-shrub

Lonicera canadensis (fly honeysuckle) V.4

Forb

Actaea rubra (red baneberry) IV.1, *Aralia nudicaulis* (wild sarsaparilla) V.7, *Athyrium angustum* (lady-fern) V.15, *Circaea alpina* (small enchanter's nightshade) IV.2, *Clintonia borealis* (bluebead lily) V.1, *Coptis groenlandica* (goldthread) IV.2, *Cornus canadensis* (bunchberry) V.2, *Equisetum sylvaticum* (wood horsetail) IV.15, *Galium triflorum* (three-flowered bedstraw) V.2, *Gymnocarpium dryopteris* (common oak-fern) V.4, *Lycopodium lucidulum* (shining clubmoss) IV.1, *Maianthemum canadense* (Canada mayflower) V.2, *Mitella nuda* (naked miterwort) V.4, *Rubus pubescens* (dwarf raspberry) V.25, *Streptopus roseus* (rosey twisted-stalk) IV.1, *Trientalis borealis* (starflower) V.2

Graminoid

Carex intumescens (bladder sedge) IV.2, *Cinna latifolia* (drooping woodreed) IV.2

RANGE

Voyageurs National Park

This community occurs in small patches in localized areas throughout the Park, typically on moderate slopes. In the southwestern part of the Park it occurs on more flat terrain. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This community is found in northern Minnesota, northern Wisconsin, northern Michigan, and northwestern Ontario.

COMMENTS

This type often appears in upland-wetland interfaces, whereas the White Cedar - Yellow Birch Forest (A48) is strongly upland. Nonetheless, it is often mapped as part of that same type. In contrast to the White Cedar - (Mixed Conifer) / Alder Swamp (A17), this type generally does not contain *Alnus incana* (speckled alder) in the shrub layer or significant cover of *Sphagnum* spp., but does contain a mix of upland herbs. Intermediate stands, however, do exist. When black ash dominates in the emergent layer or canopy approaching 25% relative cover, this community can grade into the White Cedar - Black Ash Swamp (A15). The A12 type is most similar to Ontario's W32, but may be somewhat drier (Harris and others, 1996), and to V21 of Sims and others (1997).

MAP UNITS

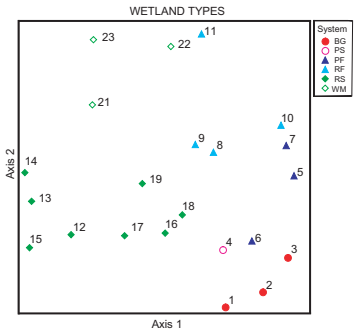
The White Cedar-Boreal Conifer Mesic Forest (WCU) map unit represents this association.

MINNESOTA STATE TYPE 2003

Lowland White Cedar Forest (Northern) (WFn53b)

A13 Trembling Aspen - Balsam Poplar Lowland Forest

Populus tremuloides - *Populus balsamifera* - Mixed Hardwoods Lowland Forest



Description

The canopy of this community is commonly 15–20 m tall and consists of trembling aspen and balsam poplar. Black ash can occasionally reach the canopy as well, though is usually found only in the subcanopy at 20–30% cover. The shrub layer is highly variable, ranging from 20 to 90% cover. It commonly consists of black ash, balsam fir and *Alnus incana* (speckled alder). The herb layer is typically very diverse and covers 80–90% of the forest floor. The most abundant herbaceous species are *Aralia nudicaulis* (wild sarsaparilla), *Aster lateriflorus* (side-flowering aster), *Circaea alpina* (small enchanter's nightshade), *Equisetum sylvaticum* (wood horsetail), *Galium triflorum* (three-flowered bedstraw), *Iris versicolor* (northern blue flag), *Lactuca* sp. (lactuca), *Lycopus uniflorus* (northern bugleweed), *Maianthemum canadense* (Canada mayflower), *Rubus pubescens* (dwarf raspberry), *Taraxacum* sp. (dandelion), and *Trientalis borealis* (starflower).

This type generally occurs on very flat to slightly sloping (<5%) terrain. It can be extensive where the terrain is relatively flat and where poorly drained soils are more common. It can also be found in low areas surrounded by upland or in drainage areas adjacent to lakes. The soils are generally poorly drained and relatively deep, reaching depths >35 cm. Stands occur on consistently deep, heavy, lacustrine clays or sandy clays.

CHARACTERISTIC SPECIES (n = 5, 23)

Tree

Fraxinus nigra (black ash) V.25, *Fraxinus pennsylvanica* (green ash) IV.7, *Populus tremuloides* (trembling aspen) IV.25

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) IV.4, *Alnus incana* (speckled alder) V.15, *Amelanchier* spp. (serviceberry) V.2, *Betula papyrifera* (paper birch) IV.7, *Cornus stolonifera* (red-osier dogwood) IV.4, *Corylus cornuta* (beaked hazelnut) V.7, *Fraxinus nigra* (black ash) V.45, *Fraxinus pennsylvanica* (green ash) IV.25, *Picea glauca* (white spruce) IV.4, *Populus tremuloides* (trembling aspen) IV.7, *Ulmus americana* (American elm) V.7, *Viburnum lentago* (nannyberry) IV.4

Dwarf-shrub

Rosa blanda (and others) (rose) V.1, *Rubus strigosus* (red raspberry) V.7

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster lateriflorus* (side-flowering aster) V.2, *Aster macrophyllus* (large-leaved aster) IV.4, *Athyrium angustum* (lady-fern) IV.15, *Circaea alpina* (small enchanter's nightshade) V.2, *Cornus canadensis* (bunchberry) IV.4, *Equisetum sylvaticum* (wood horsetail) V.7, *Fragaria virginiana* (common strawberry) IV.4, *Galium triflorum* (three-flowered bedstraw) V.4, *Iris versicolor* (northern blue flag) V.1, *Lactuca* sp. (lactuca) V.1, *Lycopus uniflorus* (northern bugleweed) V.4, *Maianthemum canadense* (Canada mayflower) V.4, *Rubus pubescens* (dwarf raspberry) V.25, *Taraxacum* sp. (dandelion) V.1, *Trientalis borealis* (starflower) V.2

Graminoid

Bromus ciliatus (fringed brome) IV.4, *Carex intumescens* (bladder sedge) IV.7

RANGE

Voyageurs National Park

This type is most common in the west and southwest part of the Park and in Park environs, where the terrain is relatively flat and poorly drained soils are more common, but also occurs locally elsewhere in the Park in areas surrounded by upland or in drainage areas adjacent to lakes. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This association is found in northern Michigan, northern Wisconsin, and Ontario.

COMMENTS

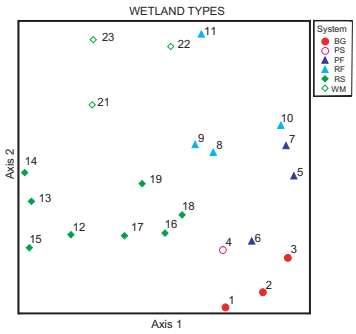
Diagnostic features of the type include a canopy of trembling aspen and/or balsam poplar with black ash, *Alnus incana* (speckled alder), or balsam poplar present in the sub-canopy or shrub layers. Though the canopy can be very similar to the Aspen Birch / Boreal Conifer Forest (A46), that type does not contain balsam poplar with black ash, or *Alnus incana*. That type (A46) also has lower diversity of herbaceous plants than this type (A13), and is found on well-drained soils. Very often, stands of A13 type are found adjacent to (and slightly drier than) the Black Ash - Mixed Hardwood Swamp (A14) or as inclusions within A46. The A13 type is most similar to Ontario's V1 (Sims and others, 1997).

(Continued on page 123)

50

A14 Black Ash - Mixed Hardwood Swamp

Fraxinus nigra - Mixed Hardwoods-Conifers / *Cornus sericea* / *Carex* spp. Forest



Description

The canopy and subcanopy (if present) of this community most commonly consists solely of black ash. In some situations, white-cedar may be mixed in these layers at low cover (<25%). Canopy cover is typically 70–90% but may be as low as 40%. Black ash saplings may dominate in the shrub/sapling layer. In wetter stands, *Alnus incana* (speckled alder) shrubs may be present, typically around 20–30% cover. Balsam fir and *Acer spicatum* (mountain maple) can also occasionally be found in the shrub layers. The herb layer is very diverse and usually reaches 80–100% cover. The most abundant graminoids are *Carex gracillima* (graceful sedge) and *C. intumescens* (bladder sedge). Characteristic forbs include *Athyrium angustum* (lady-fern), *Circaea alpina* (small enchanter's nightshade), *Equisetum sylvaticum* (wood horsetail), *Galium triflorum* (three-flowered bedstraw), *Lycopus uniflorus* (northern bugleweed), *Rubus pubescens* (dwarf raspberry), *Scutellaria lateriflora* (mad-dog skullcap), and *Trientalis borealis* (starflower). Mosses are more prevalent in the wetter parts of stands, where bryophytes typically colonize the hollows, low hummocks and fallen logs. Species include *Rhytidiadelphus triquetrus, Calliergon cordifolium, Mnium* spp., and *Drepanocladus* spp.

This type occurs throughout the Park in shallow depressions and low areas or adjacent to peatlands. Although soils may occasionally be fairly deep peats reaching depths of >30 cm, more commonly, the soils consist of 4–10 cm mineral soils or peat over dense clay. In the wetter sites, standing water is usually present throughout the season in the hollows. Thus, depending on topographic position and substrate, the water regime in these communities can be temporarily to seasonally flooded or saturated.

CONSERVATION RANK G4 **DATABASE CODE** CEGL002105

CHARACTERISTIC SPECIES (n = 5, 37)

Tree

Fraxinus nigra (black ash) V.55

Shrub

Abies balsamea (balsam fir) IV.4, *Acer spicatum* (mountain maple) V.7, *Fraxinus nigra* (black ash) V.65, *Ulmus americana* (American elm) IV.7

Dwarf-shrub

Rubus strigosus (red raspberry) V.7

Forb

Aster lateriflorus (side-flowering aster) IV.7, *Athyrium angustum* (lady-fern) V.15, *Caltha palustris* (swamp marsh-marigold) IV.4, *Circaea alpina* (small enchanter's nightshade) V.2, *Equisetum sylvaticum* (wood horsetail) V.15, *Galium triflorum* (three-flowered bedstraw) V.2, *Lycopus uniflorus* (northern bugleweed) V.2, *Rubus pubescens* (dwarf raspberry) V.15, *Scutellaria lateriflora* (mad-dog skullcap) V.2, *Trientalis borealis* (starflower) V.1

Graminoid

Carex gracillima (graceful sedge) V.4, *Carex intumescens* (bladder sedge) V.7, *Cinna latifolia* (drooping woodreed) IV.7

RANGE

Voyageurs National Park

This community type occurs throughout the Park in shallow depressions and low areas or adjacent to peatlands. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This black ash - hardwood swamp forest type is found widely in the northern Midwest region of the United States and into the boreal region of Central Canada. This association is found in Illinois, Michigan, Minnesota, western North Dakota, Wisconsin, Manitoba, and Ontario. It may also occur in Indiana.

COMMENTS

Voyageurs National Park

The main diagnostic feature of the type is a canopy of black ash. As cedar becomes more common in the canopy and subcanopy, this type grades into the White Cedar - Black Ash Swamp (A15), but this type differs from A15 in that it contains <25% cover of white-cedar in the canopy or subcanopy. Stands intermediate between these two types are common. Stands of mixed aspen and ash may resemble the Trembling Aspen - Balsam Poplar Lowland Forest (A13). Many stands of this type (A14) occur in drainages influenced by beaver activity, and because black ash trees cannot survive prolonged periods of inundation, these communities are frequently flooded out by beaver activity. The A14 type is similar to Ontario's W33 and W34 (Harris and others, 1996).

MAP UNITS

The Black Ash-Mixed Hardwood Swamp (BA) map unit represents this association.

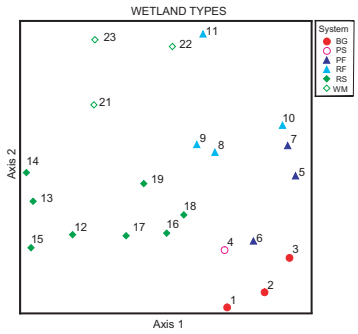
MINNESOTA STATE TYPE 2003

Black Ash - Alder Swamp (Northern) (WFn64c)

52

A15 White Cedar - Black Ash Swamp

Thuja occidentalis - Fraxinus nigra Forest



Description

This community consists of a mixed canopy of black ash and white-cedar, each comprising at least 25% relative cover. It is also found with a canopy solely of black ash (usually 80–100% cover) and a subcanopy of white-cedar (40–90% cover). The shrub layer, with 20–40% cover, is dominated by *Acer spicatum* (mountain maple), *Alnus incana* (speckled alder), balsam fir, and black ash, with some red maple. *Alnus incana* alone may occasionally occupy the shrub layer at 70–90% cover. The herb layer usually covers 80–100% of the forest floor and is very diverse. The most common herbs are *Equisetum sylvaticum* (wood horsetail), *Carex intumescens* (bladder sedge), *C. gracillima* (graceful sedge), *Calamagrostis canadensis* (bluejoint), and *Coptis groenlandica* (gold-thread). Moss cover is highly variable ranging from 30 to 90%. *Rhytidiadelphus triquetrus*, *Calliergon cordifolium, C. giganteum, Mnium* spp., *Thuidium* spp. *Sphagnum warnstorfii,* and *S. squarrosum* are the most abundant mosses.

This type is found in confined basins surrounded by upland or as part of large wetland complexes. If associated with peatlands, it is usually found on the upland border where more minerotrophic conditions exist. Soils are either deep, well decomposed peats or shallow, well decomposed peats over clay. Microtopography of hummocks and hollows may be well developed or absent. Standing water is often present. The water regime is seasonally flooded to saturated.

CONSERVATION RANK G? **DATABASE CODE** CEGL005165

CHARACTERISTIC SPECIES (n = 1, 26)

Tree

*Abies balsamea (*balsam fir) V.15, *Fraxinus nigra* (black ash) V.85, *Thuja occidentalis* (white-cedar) V.65

Shrub

Abies balsamea (balsam fir) V.4, *Acer spicatum* (mountain maple) V.15, *Alnus incana* (speckled alder) V.4, *Thuja occidentalis* (white-cedar) V.4

Forb

Circaea alpina (small enchanter's nightshade) V.4, *Mitella nuda* (naked miterwort) V.4, *Rubus pubescens* (dwarf raspberry) V.15

Graminoid

Carex gracillima (graceful sedge) V.4, *Cinna latifolia* (drooping woodreed) V.4

RANGE

Voyageurs National Park

This type is found in pockets throughout the Park, but also occurs as large stands in the environs west of Park, and along the margins of the Rat Root River Peatland. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This association is found in the northern Great Lakes region of the United States and throughout central Canada.

COMMENTS

Diagnostic features of the type include the canopy of white-cedar and black ash, both comprising at least 25% cover, or stands that have a canopy of all black ash, with at least 25% cover of white-cedar in the subcanopy. This type intergrades with the Black Ash - Mixed Hardwood Swamp (A14), and is similar in terms of moisture and mineral status, but A14 has white-cedar with <25% cover. When the cover of black ash in the canopy is <25%, the stand is more likely to belong to the White Cedar - Boreal Conifer Mesic Forest (A12). The A15 type may be flooded as a result of beaver activity. The White Cedar - Black Ash Swamp has no clear match to Ontario types.

MAP UNITS

The White Cedar-Black Ash Swamp (WCBA) map unit represents this association.

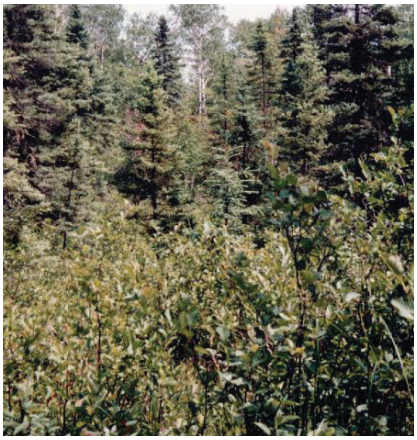
MINNESOTA STATE TYPE 2003

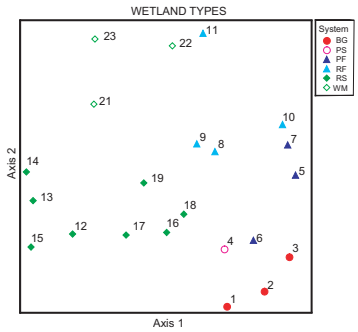
Black Ash - Conifer Swamp (Northeast) (WFn64a)

54

A16 Black Spruce / Alder Rich Swamp

Picea mariana / Alnus incana / Sphagnum spp. Forest





Description

The canopy of black spruce in this community is typically uneven and fairly open, ranging from 20 to 40%. In rare cases, canopy coverage may be as high as 90%. Tamarack and white-cedar can also be found in the canopy at low cover. A shrub layer of *Alnus incana* (speckled alder) and black spruce ranges from 30 to 90%. The dwarf-shrub layer is dominated by *Ledum groenlandicum* (labrador tea) and, less commonly, *Chamaedaphne calyculata* (leatherleaf). Coverage of dwarf-shrubs is highly variable (10–80%). The herb layer is typically moderately rich, variable in cover, and dominated by *Calamagrostis canadensis* (bluejoint), *Smilacina trifolia* (three-leaved false Solomon's-seal), and/or *Carex lacustris* (lake sedge). *Carex trisperma* (three-fruited sedge), *Cornus canadensis* (bunchberry), and *Dryopteris carthusiana* (spinulose fern) are also common. Sphagnum typically occupies 90–100% of the forest floor. The most abundant species are *Sphagnum magellanicum, S. girgensohnii, S. centrale, S. wulfianum,* and *S. recurvum sensu lato*.

This type occurs as part of large peatlands, in confined basins and along the upland margins of less minerotrophic peatlands. The substrate is deep peat or peat over clay. Hummock and hollow microtopography is moderately to well developed with standing water occasionally occurring in the hollows. The water regime is saturated.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002452

CHARACTERISTIC SPECIES (n = 7, 22)

Tree

Larix laricina (tamarack) III.15, *Picea mariana* (black spruce) V.25

Shrub

Abies balsamea (balsam fir) V.7, *Acer rubrum* (red maple) IV.2, *Alnus incana* (speckled alder) V.45, *Betula papyrifera* (paper birch) V.15, *Larix laricina* (tamarack) IV.15, *Picea mariana* (black spruce) V.35

Dwarf-shrub

Gaultheria hispidula (creeping snowberry) V.7, *Ledum groenlandicum* (labrador tea) V.35, *Vaccinium angustifolium* (lowbush blueberry) V.2

Forb

Cornus canadensis (bunchberry) V.2, *Dryopteris carthusiana* (and others) (spinulose fern) V.1, *Smilacina trifolia* (three-leaved false Solomon's-seal) V.7, *Trientalis borealis* (starflower) V.2

Graminoid

Calamagrostis canadensis (bluejoint) IV.15, *Carex paupercula* (poor sedge) III.4, *Carex trisperma* (three-fruited sedge) V.4

RANGE

Voyageurs National Park

This type is most common in the northern parts of the Park, where peatlands are more extensive, but can be found throughout the Park in small confined basins. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This community is found in the northern Great Lakes region of the United States and in central Canada.

COMMENTS

Diagnostic features of the type include the canopy of black spruce and <25% cover of other conifers, with a shrub layer of *Alnus incana* (speckled alder). This type is similar to the Black Spruce / Labrador Tea Poor Swamp (A4) but that type often contains >25% relative cover of tamarack, and lacks the minerotrophic indicators of this type, such as *Calamagrostis canadensis* (bluejoint). In stands where tree cover is low, this type can grade into the peat phase of the Speckled Alder Swamp (A19). The A16 type is similar to Ontario's W29 and W30 (Harris and others, 1996).

MAP UNITS

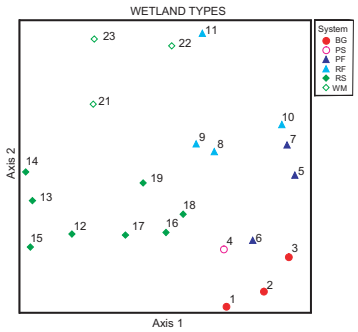
The Black Spruce/Alder Rich Swamp (BSAS) map unit represents this association.

MINNESOTA STATE TYPE 2003

Rich Black Spruce Swamp (Basin) (FPn62a)

A17 White Cedar - (Mixed Conifer) / Alder Swamp

Thuja occidentalis - (Picea mariana - Abies balsamea) / Alnus incana Forest



Description

In this community, white-cedar typically forms a fairly closed canopy, with cover ranging from 70 to 100%. Associates include tamarack, black spruce, and black ash. In larger peatlands, the canopy may be as low as 30%, and an emergent layer of black spruce may be present. A shrub layer of *Alnus incana* (speckled alder), with balsam fir, white-cedar, and tamarack is nearly always present, but cover is highly variable, ranging from 20 to 90%. *Ledum groenlandicum* (labrador tea) is occasionally prominent in the dwarf-shrub layer. Species diversity in the herb layer is very high. Graminoids include *Calamagrostis canadensis* (bluejoint), *Carex disperma* (soft-leaved sedge), *C. leptalea* (bristle-stalked sedge), and *C. paupercula* (poor sedge). Forbs include *Caltha palustris* (swamp marsh-marigold), *Coptis groenlandica* (goldthread), *Cornus canadensis* (bunchberry), *Iris versicolor* (northern blue flag), *Potentilla palustris* (marsh cinquefoil), *Rubus pubescens* (dwarf raspberry), *Smilacina trifolia* (three-leaved false Solomon's-seal) and *Trientalis borealis* (starflower). The moss-lichen layer can also be very diverse. In some circumstances, *Sphagnum* spp. dominate this layer with 90–100% cover, leaving other species like *Rhytidiadelphus triquetrus* and *Calliergon cordifolium* to colonize the wet hollows. In other cases, though, sphagnum is found sharing dominance with a mix of *Rhytidiadelphus triquetrus, Calliergon cordifolium, C. giganteum, Rhizomnium magnifolium, R. pseudopunctatum,* and *Climacium dendroides*. In both cases, the dominant sphagnum species found in this community are *Sphagnum warnstorfii, S. wulfianum, S. centrale*, and *S. recurvum sensu lato.*

This type occurs in moderately minerotrophic conditions over deep peat. Hummock and hollow microtopography is usually well developed. In wetter stands, there is often standing water present in the hollows. Coarse woody debris can be significant. The water regime is saturated.

CHARACTERISTIC SPECIES (n = 4, 38)

Tree

Larix laricina (tamarack) IV.7, *Picea mariana* (black spruce) IV.1, *Thuja occidentalis* (white-cedar) IV.25

Shrub

Abies balsamea (balsam fir) V.7, *Alnus incana* (speckled alder) V.55, *Betula glandulifera* (bog-birch) III.4, *Cornus foemina* (gray dogwood) III.4, *Cornus stolonifera* (red-osier dogwood) IV.1, *Larix laricina* (tamarack) V.15, *Picea mariana* (black spruce) V.2, *Thuja occidentalis* (white-cedar) V.45

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) IV.1, *Gaultheria hispidula* (creeping snowberry) V.2, *Ledum groenlandicum* (labrador tea) V.25, *Lonicera oblongifolia* (swamp fly-honeysuckle) V.2, *Rhamnus alnifolia* (alder-leaved buckthorn) V.2, *Vaccinium oxycoccus* (small cranberry) V.4

Forb

Caltha palustris (swamp marsh-marigold) V.2, *Campanula aparinoides* (marsh bellflower) IV.1, *Clintonia borealis* (bluebead lily) IV.2, *Coptis groenlandica* (goldthread) V.2, *Cornus canadensis* (bunchberry) V.4, *Cypripedium reginae* (showy lady-slipper) IV.7, *Dryopteris cristata* (crested fern) IV.1, *Epilobium leptophyllum* (and others) (fireweed) IV.1, *Galium triflorum* (three-flowered bedstraw) IV.2, *Iris versicolor* (northern blue flag) V.2, *Linnaea borealis* (twinflower) IV.1, *Maianthemum canadense* (Canada mayflower) IV.1, *Mitella nuda* (naked miterwort) IV.1, *Osmunda cinnamomea* (cinnamon fern) III.4, *Platanthera hyperborea* (northern bog-orchid) IV.2, *Potentilla palustris* (marsh cinquefoil) V.2, *Pyrola secunda* (one-sided pyrola) IV.1, *Rubus pubescens* (dwarf raspberry) V.15, *Smilacina trifolia* (three-leaved false Solomon's-seal) V.7, *Thelypteris palustris* (northern marsh-fern) IV.1, *Trientalis borealis* (starflower) V.2

Graminoid

Calamagrostis canadensis (bluejoint) V.4, *Carex cephalantha* (bunched sedge) III.4, *C. disperma* (soft-leaved sedge) V.2, *C. leptalea* (bristle-stalked sedge) V.15, *C. paupercula* (poor sedge) V.4

RANGE

Voyageurs National Park

This type occurs in localized areas throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

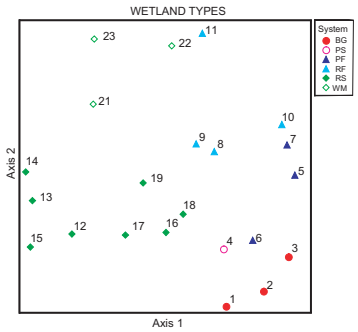
This community is found in the upper Great Lakes region of the United States and parts of central Canada.

(Continued on page 123)

58

A18 Northern Tamarack Rich Swamp

Larix laricina / Alnus incana Forest



Description

In this community, the canopy of tamarack is typically uneven and fairly open, ranging from 20 to 50%. White-cedar and black spruce may also occur in the canopy at low densities (<25% relative cover). A shrub layer of *Alnus incana* (speckled alder) and *Betula glandulifera* (bog-birch) is typically present at 40–90% cover. The shrub layer may also include *Salix* spp. (willow), typically *S. pyrifolia, S. discolor,* and/or *S. pedicellaris*. A dwarf-shrub layer of *Ledum groenlandicum* (labrador tea) and *Chamaedaphne calyculata* (leatherleaf) is typically present at 70–90% cover, though it may be as low as 10% cover in some stands. The herb layer is moderately species rich and highly variable in cover, ranging from very low to continuous. The most abundant species are *Calamagrostis canadensis* (bluejoint), *Smilacina trifolia* (three-leaved false Solomon's-seal), and *Carex lacustris* (lake-sedge). *Rubus pubescens* (dwarf raspberry), *Carex leptalea* (bristle-stalked sedge), *Lysimachia thyrsiflora* (tufted loosestrife), and *Potentilla palustris* (marsh cinquefoil) are also commonly present. Sphagnum typically occupies 90–100% of the forest floor. The most abundant species are *Sphagnum magellanicum, S. recurvum sensu lato,* and *S. russowii. Calliergon cordifolium* and/or *C. giganteum* infrequently colonize the wet hollows.

This type occurs as part of large peatlands, in confined basins and along the upland margins of less minerotrophic peatlands. The substrate is deep peat or shallow peat over clay. Hummock and hollow microtopography is moderately to well developed, with standing water occasionally occurring in the hollows. The water regime is saturated.

CONSERVATION RANK G4 **DATABASE CODE** CEGL002471

CHARACTERISTIC SPECIES (n = 8, 52)

Tree

Larix laricina (tamarack) IV.7, *Picea mariana* (black spruce) III.7

Shrub

Alnus incana (speckled alder) IV.15, *Betula glandulifera* (bog-birch) V.35, *Larix laricina* (tamarack) V.25, *Picea mariana* (black spruce) V.25, *Salix pedicellaris* (bog willow) V.2, *Thuja occidentalis* (white-cedar) V.15

Dwarf-shrub

Andromeda glaucophylla (bog-rosemary) V.15, *Chamaedaphne calyculata* (leatherleaf) V.15, *Gaultheria hispidula* (creeping snowberry) IV.1, *Kalmia polifolia* (bog laurel) IV.1, *Ledum groenlandicum* (labrador tea) V.35, *Lonicera oblongifolia* (swamp fly-honeysuckle) IV.1, *Lonicera villosa* (mountain fly-honeysuckle) IV.1, *Myrica gale* (sweet gale) III.4, *Vaccinium oxycoccus* (small cranberry) V.2

Forb

Caltha palustris (swamp marsh-marigold) IV.1, *Drosera rotundifolia* (round-leaved sundew) IV.1, *Epilobium leptophyllum* (and others) (fireweed) IV.2, *Equisetum fluviatile* (water horsetail) III.4, *Lysimachia thyrsiflora* (tufted loosestrife) V.4, *Maianthemum canadense* (Canada mayflower) IV.1, *Menyanthes trifoliata* (buckbean) IV.4, *Osmunda cinnamomea* (cinnamon fern) III.4, *Potentilla palustris* (marsh cinquefoil) V.2, *Rubus acaulis* (arctic raspberry) IV.4, *Rubus pubescens* (dwarf raspberry) IV.2, *Rumex orbiculatus* (great water dock) IV.1, *Sarracenia purpurea* (pitcher-plant) IV.1, *Smilacina trifolia* (three-leaved false Solomon's-seal) V.7, *Trientalis borealis* (starflower) IV.1

Graminoid

Calamagrostis canadensis (bluejoint) IV.1, *Carex leptalea* (bristle-stalked sedge) V.4, *Carex paupercula* (poor sedge) V.4

RANGE

Voyageurs National Park

This type occurs as part of large peatlands, in confined basins and along the upland margins of less minerotrophic peatlands throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This community is found in the United States in northern and central parts of Minnesota, Wisconsin, and Michigan; and in Canada in Ontario, Manitoba, and probably elsewhere.

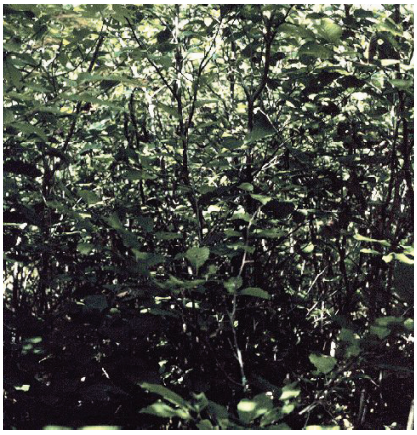
COMMENTS

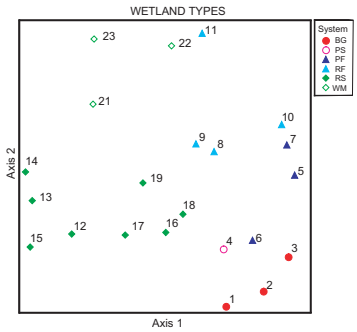
Diagnostic features of the type include a canopy strongly dominated by tamarack, with *Alnus incana* (speckled alder) in the shrub layer. This type is usually wetter than the Black Spruce / Alder Rich Swamp (A16) or the Black Spruce / Labrador Tea Poor Swamp (A4), but the *Sphagnum* spp. layer can range from patchy to more continuous. The type differs from those communities by having black spruce at <25% relative cover, and moderately minerotrophic indicators. The type can also grade into the peat phase of the Speckled Alder Swamp (A19) when canopy cover thins out to <20% cover. The A18 type is somewhat analogous to Ontario's W32 (Harris and others, 1996).

(Continued on page 123)

A19 Speckled Alder Swamp

Alnus incana Swamp Shrubland





Description

Alnus incana (speckled alder) shrubs, around 2–3 m tall, usually form a dense canopy in this community. *Salix* spp. (willow) and *Betula glandulifera* (bog-birch) may also occur at low cover in the shrub layer. There is a wide variation in the composition of the herbaceous and moss-lichen layers, largely as a result of the wide range of environmental conditions where this community can exist. In most circumstances, the herb layer ranges from 30 to 90% and is dominated by *Calamagrostis canadensis* (bluejoint), *Carex lacustris* (lake-sedge), *Rubus pubescens* (dwarf raspberry), *Typha* spp. (cattail), *Potentilla palustris* (marsh cinquefoil), and *Calla palustris* (wild calla). Some examples of this type contain a nearly continuous carpet of sphagnum. In these situations, *Chamaedaphne calyculata* (leatherleaf) may be found as a dwarf-shrub, and the herb layer may also contain species associated with sphagnum (e.g., *Carex trisperma* [three-fruited sedge], *C. disperma* [soft-leaved sedge], and *Smilacina trifolia* [three-leaved false Solomon's-seal]). In situations lacking sphagnum, the associated species also are lacking and the moss layer is minor and consists of *Mnium* spp., *Drepanocladus* spp., and *Climacium dendroides*.

The Speckled Alder Swamp occurs in isolated low areas surrounded by upland or as a ring around the edge of less minerotrophic peatlands. Stands can occur on deep peats, shallow peats, or mineral soils where drainage is impeded by clay or dense glacial till. Depending on substrate and topographic placement, they can be temporarily or seasonally flooded or remain saturated throughout the growing season.

CHARACTERISTIC SPECIES (n = 4, 36)

Shrub

Abies balsamea (balsam fir) IV.1, *Acer rubrum* (red maple) IV.7, *Alnus incana* (speckled alder) V.85, *Amelanchier* spp. (serviceberry) IV.1, *Betula papyrifera* (paper birch) IV.2, *Fraxinus nigra* (black ash) IV.2

Dwarf-shrub

Rubus strigosus (red raspberry) V.2, *Vaccinium angustifolium* (lowbush blueberry) IV.2

Forb

Calla palustris (wild calla) III.7, *Cornus canadensis* (bunchberry) IV.2, *Dryopteris carthusiana* (and others) (spinulose fern) IV.1, *D. cristata* (crested fern) IV.1, *Iris versicolor* (northern blue flag) IV.1, *Lycopus uniflorus* (northern bugleweed) IV.7, *Maianthemum canadense* (Canada mayflower) IV.1, *Rubus pubescens* (dwarf raspberry) IV.7, *Smilacina trifolia* (three-leaved false Solomon's-seal) III.7, *Trientalis borealis* (starflower) IV.1

Graminoid

Calamagrostis canadensis (bluejoint) V.15, *Carex disperma* (soft-leaved sedge) III.4, *C. lacustris* (lake-sedge) IV.15

RANGE

Voyageurs National Park

This community type occurs throughout the Park in isolated low areas surrounded by uplands or as a ring around the edge of less minerotrophic peatlands. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rich Swamp System.

Global

This type is widespread in the Midwest and Northeast United States, and in central Canada.

COMMENTS

The diagnostic feature of the type is a tall shrubland dominated by *Alnus incana* (speckled alder). In situations where willow or bog birch become more dominant, this community grades into the Dogwood - Pussy Willow Swamp (A21) or the Bog Birch - Leatherleaf Poor Fen (A8). In non-peatland situations, this type can have <25% black ash canopy over the alder shrub layer. The Black Spruce / Alder Rich Swamp (A16), the Black Spruce / Labrador Tea Poor Swamp (A4), and the Northern Tamarack Rich Swamp (A18) all can resemble this type, but differ in that they contain >25% cover of conifers in the canopy. More data are needed to determine if separate associations are needed for a mineral-soil Alder Swamp (more like wet meadows) and a peatland Alder Swamp. The A19 type is similar to Ontario's W35 (Harris and others, 1996).

Basins with water levels controlled by beavers can experience fluctuating water levels. Alder often persists after trees such as black spruce or white-cedar have died from the rising water levels. Outside the Park, this type can be found in wetlands (including peatlands) that have been recently logged.

MAP UNITS

The Speckled Alder Swamp (AS) map unit represents this association.

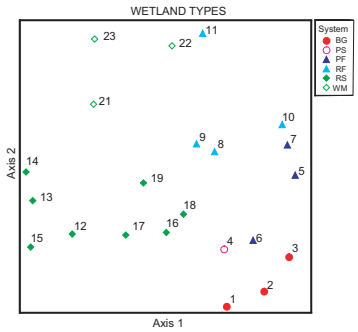
MINNESOTA STATE TYPE 2003

Alder Swamp [peat phase] (FPn73a)

62

A21 Dogwood - Pussy Willow Swamp

Cornus spp. - *Salix discolor - (Rosa palustris)* Shrubland



Description

This community contains a shrub layer mainly of willows 1–5 m tall and usually 40–70% cover. The most abundant willow species are *Salix discolor* (pussy willow) and *S. gracilis* (slender willow). The following willow species are also common though usually present at low cover*: S. planifolia* (diamond-leaf willow)*, S. serissima* (autumn-leaf willow), *S. pedicellaris* (bog willow), and *S. candida* (sage-leaf willow). Other, less common shrubs include *Cornus sericea* (red-osier dogwood)*, Spiraea alba* (meadowsweet), and *Alnus incana* (speckled alder). Herbaceous cover is typically high (90–100%) and is made up primarily of the graminoids *Calamagrostis canadensis* (bluejoint) and *Carex lacustris* (lake-sedge). Forbs include *Acorus calamus* (sweet flag), *Dryopteris cristata* (crested fern), *Rubus pubescens* (dwarf raspberry), and *Typha* sp. (cattail). Mosses may be present, around 10–30% cover, or absent. The most common moss species include *Aulacomnium palustre*, *Campylium stellatum*, *Hypnum lindbergii, Sphagnum* spp., *Drepanocladus* spp.*, Calliergon cordifolium, C. giganteum,* and *Climacium dendroides.* In rare cases, *Sphagnum* spp. may have nearly 100% cover and form a continuous carpet. This occurs primarily when this type is adjacent to a peatland.

Stands commonly occupy beaver meadows and the shorelines of the large lakes in sheltered bays. They infrequently occur up to the water's edge but are often found between the upland and a shallow marsh, wet meadow, or fen. A thick (2–5 cm) thatch layer of undecomposed organic matter is common. Soils are typically shallow peats over dense lacustrine clay, but some deep peat stands may occur. Hummock and hollow microtopography may be present. The water regime is temporarily to seasonally flooded or saturated.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002186

CHARACTERISTIC SPECIES (n = 4, 30)

Shrub

Alnus incana (speckled alder) III.4, *Betula papyrifera* (paper birch) IV.2, *Cornus stolonifera* (red-osier dogwood) V.7, *Fraxinus nigra* (black ash) IV.1, *Salix bebbiana* (bebb's willow) IV.15, *S. discolor* (pussy willow) IV.15, *S. gracilis* (slender willow) V.35

Dwarf-shrub

Spiraea alba (meadowsweet) IV.15

Forb

Acorus calamus (sweet flag) IV.7, *Campanula aparinoides* (marsh bellflower) IV.2, *Dryopteris cristata* (crested fern) V.2, *Rubus pubescens* (dwarf raspberry) IV.7, *Typha* sp. (cattail) IV.2

Graminoid

Calamagrostis canadensis (bluejoint) V.55, *Carex lacustris* (lake-sedge) IV.35, *Scirpus cyperinus* (wool-grass) V.7

RANGE

Voyageurs National Park

This community type commonly occupies beaver meadows and the shorelines of the large lakes in sheltered bays throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Wet Meadow - Shrub Swamp System.

Global

This dogwood-willow shrub swamp community type is found in the upper Midwestern region of the United States in New York, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, and into southern Ontario and central Canada.

COMMENTS

Diagnostic features of the type are the diverse mix of willows. This type is closely related to the Canada Bluejoint Eastern Meadow (A23), the Northern Sedge Wet Meadow (A22), and the mineral soil phase of the Speckled Alder Swamp (A19). Sometimes this type can have a mixture of willows and *Alnus incana* (speckled alder) or *Betula glandulifera* (bog-birch), grading into Bog Birch - Willow Shore Fen (A8). The A21 type is similar to Ontario's W36 (Harris and others, 1996).

MAP UNITS

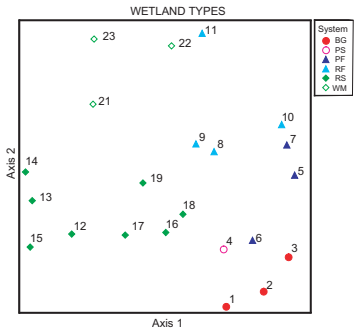
The Dogwood-Pussy Willow Swamp (DS) map unit represents this association.

MINNESOTA STATE TYPE 2003

Willow - Dogwood Shrub Swamp (WMn82a)

A22 Northern Sedge Wet Meadow

Carex (rostrata, utriculata) - Carex lacustris - (Carex vesicaria) Herbaceous Vegetation



Description

This community is most commonly dominated by *Calamagrostis canadensis* (bluejoint), *Carex lacustris* (lake-sedge), *C. lasiocarpa* (wire-sedge), and *C. rostrata (=utriculata)* (beaked sedge). In some circumstances, *C. rostrata* (beaked sedge) and/or *C. vesicaria* (inflated sedge) may share dominance with *C. lacustris* or obtain complete dominance. Cover of this herb layer is usually 90–100%. Shrubs of *Alnus incana* (speckled alder), *Chamaedaphne calyculata* (leatherleaf), or *Salix* spp. (willow) may be found at low cover (<25%). Stands with standing water or water channels running through them may contain species typical of wetter conditions like *Acorus calamus* (sweet flag) or *Potentilla palustris* (marsh cinquefoil). In most circumstances, the moss layer is virtually absent.

This community type occurs in beaver meadows, along lake shores, along slow moving streams and in isolated basins. Substrate is most often deep sedge peat under various stages of decomposition, or shallow (5–10 cm) peat over clay. A thick thatch layer over the peat may be present. The peat mat may occasionally be floating. Standing dead trees, especially in beaver meadows, are common. Hummock and hollow microtopography is usually well developed. Standing water is common in the hollows. The water regime is highly variable, ranging from saturated to permanently flooded.

CONSERVATION RANK G4G5Q **DATABASE CODE** CEGL002257

CHARACTERISTIC SPECIES (n = 7, 35)

Forb

Acorus calamus (sweet flag) III.15, *Potentilla palustris* (marsh cinquefoil) V.4

Graminoid

Calamagrostis canadensis (bluejoint) V.15, *Carex lacustris* (lake-sedge) III.35, *C. lasiocarpa* (wire-sedge) III.25, *C. rostrata* (beaked sedge) III.25

RANGE

Voyageurs National Park

This community type occurs in beaver meadows, along lake shores and slow moving streams, and in isolated basins throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Wet Meadow - Shrub Swamp System.

Global

This association is found in Iowa, Michigan, Minnesota, Wisconsin, Manitoba, Ontario, and possibly North and South Dakota.

COMMENTS

Diagnostic features of the type are >40% cover of *C. lacustris* (lake-sedge) or *C. rostrata* (beaked sedge). The sedges in this community can occasionally occur mixed with *Typha* spp. (cattail) and *Calamagrostis canadensis* (bluejoint), grading into the Midwest Cattail Deep Marsh (A24) and the Canada Bluejoint Eastern Meadow (A23) respectively. When *Carex* spp. occurs mixed with *Typha* spp. or *Calamagrostis canadensis*, there must be >50% cover of sedges to remain in this type. Occasionally, *Alnus incana* (speckled alder) or other shrubs may invade this type. The shrubs must have >25% cover for the stand to be considered a Speckled Alder Swamp (A19) or other shrub type. Stands dominated by *Carex lasiocarpa* (wire-sedge) are placed in the Wiregrass Sedge Shore Fen (A11). The A22 type is similar to Ontario's W12 (Harris and others, 1996).

This community is subject to disturbance by beaver activity. In recently flooded beaver ponds, small patches of this type may occur interspersed with small patches of Northern Water Lily Aquatic Wetland (A30).

MAP UNITS

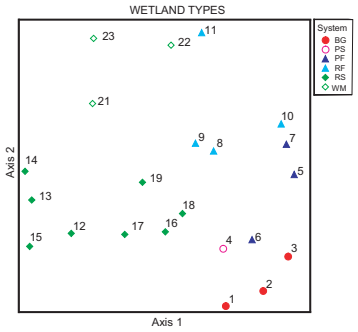
This association is represented with the Wet Meadow/Fen Mosaic/Complex (SMX) map unit, which also includes other associations.

MINNESOTA STATE TYPE 2003

Sedge Meadow Beaked Sedge Subtype (WMn82b3)
Sedge Meadow Lake Sedge Subtype (WMn82b4)

A23 Canada Bluejoint Eastern Meadow

Calamagrostis canadensis Eastern Herbaceous Vegetation



Description

This community is characterized by a continuous cover of *Calamagrostis canadensis* (bluejoint). *Alnus incana* (speckled alder), *Betula glandulifera* (bog-birch), or *Salix* spp. (willow) infrequently colonize these sites at <25% cover. Other graminoid species are usually present but with low cover. These often include *Carex lacustris* (lake-sedge) and *Scirpus cyperinus* (wool-grass). Occasional forbs include *Eupatorium maculatum* (spotted joe-pye-weed), *Typha latifolia* (broad-leaved cattail), *Campanula aparinoides* (tall bellflower), *Dryopteris cristata* (crested fern), *Polygonum sagittatum* (arrow-leaved tearthumb), and *Potentilla norvegica* (rough cinquefoil). In some stands *Calamagrostis canadensis* cover can be so dense as to exclude almost all other species. Water channels occasionally occur within these stands and can contain species typical of wetter conditions.

The A23 type occurs predominately in old beaver meadows or along slow moving streams. In beaver meadows, this community is found on relatively dry sites and often occurs on the upland edge of more recent beaver floodings or completely colonizing older, drier beaver meadows. Soils usually contain deep, dense clay preventing or slowing drainage. A shallow layer of mineral soil or well decomposed peat may occur over the clay. In wetter conditions of this type, standing water may be present in low areas. In these situations, tussocky microtopography is often present. Water channels and standing or fallen dead trees are frequently present. The water regime is temporarily to seasonally flooded.

CONSERVATION RANK G?

DATABASE CODE CEGL005174

CHARACTERISTIC SPECIES (n = 5, 32)

Forb

Dryopteris cristata (crested fern) V.2, *Polygonum sagittatum* (arrow-leaved tearthumb) V.1, *Potentilla norvegica* (rough cinquefoil) V.1

Graminoid

Calamagrostis canadensis (bluejoint) V.85, *Carex lacustris* (lake-sedge) IV.15, *Scirpus cyperinus* (wool-grass) V.7

RANGE

Voyageurs National Park

This type occurs predominately in old beaver meadows or along slow moving streams throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Wet Meadow - Shrub Swamp System.

Global

This association is widespread throughout the eastern United States and adjacent southern Canada.

COMMENTS

Diagnostic features of the type include a herb layer with continuous cover of *Calamagrostis canadensis* (bluejoint). This community often occurs adjacent to, and readily grades into the Northern Sedge Wet Meadow (A22). This type can, more rarely, grade into the Midwest Cattail Deep Marsh (A24). Occasionally, *Alnus incana* (speckled alder) or other shrubs may invade this type. The shrubs must have >25% cover for the stand to be considered a Speckled Alder Swamp (A19) or other shrub type. The A23 type is similar to Ontario's W13 (Harris and others, 1996).

The Canada Bluejoint Eastern Meadow most commonly occurs in beaver meadows. Constant beaver activity can alter local hydrology and, over time, cause this community to grade into other communities.

MAP UNITS

The Canada Bluejoint Eastern Meadow (BJ) map unit represents this association. This association is also represented with the Wet Meadow/Fen Mosaic/Complex (SMX) map unit, which also includes other associations.

MINNESOTA STATE TYPE 2003

Sedge Meadow Bluejoint Subtype (WMn82b1)

68

A24 Midwest Cattail Deep Marsh

Typha spp. Midwest Herbaceous Vegetation

Description

This herbaceous community can be dominated almost exclusively by *Typha angustifolia* (narrow-leaved cattail) and *Typha latifolia* (broad-leaved cattail) or, less frequently, by a mix of *Typha* spp. and other graminoids. Near monocultures with coverage of 80–100% of *Typha* spp. are common. Other possible species (usually at low cover) include *Scirpus validus* (softstem bulrush), *Phragmites australis* (common reed), *Calamagrostis canadensis* (bluejoint), *Polygonum lapathifolium* (nodding smartweed), *Sagittaria cuneata* (arum-leaf arrowhead), and *S. latifolia* (broad-leaf arrowhead). In cattail stands located on the shores of a lake, it is common to find submerged or floating-leaved aquatic species at low density, such as *Ceratophyllum demersum* (coon-tail), *Lemna* spp. (duckweed), *Myriophyllum sibiricum* (Siberian water-milfoil), *Utricularia vulgaris* (greater bladderwort), and *Potamogeton* spp. (pondweed).

Stands are most commonly found in 0.25–1 m of water along the shores of lakes. Wave exposure is low to moderate and substrate is clay, sand or muck. In more isolated sites, a floating mat may develop. This community can also occur in beaver floodings and low areas surrounded by upland. In these instances, substrate is usually well decomposed peat and the water regime is permanently to temporarily flooded. Open water is common in both circumstances.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002233

CHARACTERISTIC SPECIES (n = 6, 36)

Forb

Typha spp. (cattail) V.65

Graminoid

Scirpus validus (softstem bulrush) III.7

RANGE

Voyageurs National Park

This community type is typically found along the shores of lakes and ponds. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This association is found throughout the north-central and northeastern United States and adjacent Canada.

COMMENTS

The diagnostic feature of this herbaceous community is a continuous cover of cattails (*Typha latifolia, T. angustifolia,* or *T. X glauca*). Temporarily flooded or saturated cattail marshes found in shallow basins are floristically quite different from those along the shores of lakes and may represent a sub-type. Insufficient data exist to determine the relation between these two situations. Cattail stands along the shores of the lakes often contain little else other than cattail and are therefore difficult to confuse with any other type. When they exist in drier situations, especially inland, *Typha* spp. can share dominance with other graminoids, particularly sedges. Cattails may invade Northern Sedge Wet Meadow stands (A22), and if >60% cover of cattails occurs, then the stand is treated as a Midwest Cattail Deep Marsh. The A24 type is similar to Ontario's W11 (Harris and others, 1996).

MAP UNITS

The Midwest Cattail Deep Marsh (CM) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX) and the Wet Meadow/Fen Mosaic/Complex (SMX) map units, each of which also includes other associations.

MINNESOTA STATE TYPE 2003

Cattail Marsh (Northern) (MRn83b)

70

A25 Eastern Reed Marsh

Phragmites australis Semipermanently Flooded Ruderal Herbaceous Vegetation

Description

This community is composed primarily, and sometimes solely, of one species, *Phragmites australis* (common reed). Its density, however, is highly variable. In deep water (1–1.5 m deep), cover can be as low as 40%, whereas in shallow water (0–1 m) it is commonly 100%. Stands typically consist of very few species. In most cases, one or more of the following species may be present as low (0–15%) cover: *Polygonum lapathifolium* (nodding smartweed), *Typha* spp. (cattail), *Calamagrostis canadensis* (bluejoint), *Carex rostrata* (beaked sedge), and bulrushes (*Scirpus acutus,* and/or *S. validus*). In addition, a wide variety of submerged aquatic plants may be found, but these aquatics often float in from other areas without rooting, because of the high wave energy.

Stands occur on large lakes, most often on fairly wave exposed sites on sand bars or shallow areas adjacent to islands. The substrate is typically sand or, in some cases, clay or peat over clay. The density of *Phragmites australis* tends to be inversely related to water depth with the deeper stands having as much as 60% open water. Most sites contain 0.25–1 m standing water. The water regime is permanently flooded to intermittently exposed.

CONSERVATION RANK GW **DATABASE CODE** CEGL004141

CHARACTERISTIC SPECIES (n = 3, 9)

Forb

Equisetum fluviatile (water horsetail) IV.7

Graminoid

Calamagrostis canadensis (bluejoint) IV.15, *Phragmites australis* (common reed) V.85

RANGE

Voyageurs National Park

This type is restricted to shorelines of the large lakes and islands in the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This association is widespread throughout the eastern United States.

COMMENTS

Diagnostic features of the type include the herbaceous community dominated solely by *Phragmites australis* (common reed). The A25 type is similar to Ontario's W8 (Harris and others, 1996).

Phragmites australis is a species of obscure origins in central North America, and has become somewhat invasive in wetlands further south. Its presence in Voyageurs seems to be limited to relatively small stands in flooded areas of the large lakes, but it is treated here as a seminatural type, not originally part of the Voyageurs landscape. It is not recognized as a separate type in the Minnesota state classification.

MAP UNITS

The Eastern Reed Marsh (PM) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX) and the Wet Meadow/Fen Mosaic/Complex (SMX) map units, each of which also includes other associations.

MINNESOTA STATE TYPE 2003

Cattail Marsh (Northern) (MRn83b)

72

A26 Freshwater Bulrush Marsh

Scirpus acutus - (Scirpus fluviatilis) Freshwater Herbaceous Vegetation

Description

This community is dominated by *Scirpus acutus* (hardstem bulrush), *S. validus* (softstem bulrush) and, to a lesser extent, *S. fluviatilis* (river bulrush). Cover of these dominants is typically 50–90%, though in rare instances may be much lower. Floating leaf aquatics may be present at low cover, especially *Nuphar lutea var. variegatum* (yellow water-lily), *Nymphaea odorata* (fragrant white water-lily), *Lemna minor* (lesser duckweed), and *L. trisulca* (star duckweed). Submerged aquatics may also be present at low cover and include *Elodea canadensis* (Canadian elodea), *Potamogeton zosteriformis* (flat-stemmed pondweed), *P. richardsonii* (Richardson's pondweed), *P. friesii* (fries pondweed), *Myriophyllum sibiricum* (Siberian water-milfoil), and *Utricularia vulgaris* (greater bladderwort).

Stands occur on sheltered to moderately wave exposed sites, primarily on the large lakes. Water depth is typically 0.5–1.5 m and substrate is clay, muck or sand. The water regime is permanently flooded.

CONSERVATION RANK G4G5 **DATABASE CODE** CEGL002225

CHARACTERISTIC SPECIES (n = 4, 8)

Forb

Elodea canadensis (Canadian elodea) III.4, *Lemna* sp. (duckweed) IV.1, *Potamogeton richardsonii* (Richardson's pondweed) IV.1

Graminoid

Scirpus acutus (hardstem bulrush) III.35

RANGE

Voyageurs National Park

This community type occurs primarily on large lakes. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This community is found in Iowa, Minnesota, North Dakota, South Dakota, southern Manitoba, and northwestern Ontario.

COMMENTS

Diagnostic features of the type are dominance by *Scirpus acutus* (hardstem bulrush) and *Scirpus validus* (softstem bulrush). The A26 type is similar to Ontario's W7 (Harris and others, 1996).

MAP UNITS

The Freshwater Bulrush Marsh (BM) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX), which also includes other associations.

MINNESOTA STATE TYPE 2003

Bulrush Marsh (Northern) (MRn93a)

74

A27 Water Horsetail - Spikerush Marsh

Equisetum fluviatile - (Eleocharis smallii) Herbaceous Vegetation

Description

This herbaceous comunity is dominated by *Acorus calamus* (sweet flag), *Equisetum fluviatile* (water horsetail), *Polygonum lapathifolium* (nodding smartweed), *Sagittaria rigida* (sessile-fruited arrowhead), and *Typha* spp. (cattail). Stands may be dominated by just one of these species or they may occur mixed. Most commonly, *Equisetum fluviatile* co-occurs with *Acorus calamus*. *Acorus calamus* also co-dominates with *Sagittaria rigida* and, less commonly, *Sparganium chlorocarpum* (green-fruited bur-reed). Aquatic species may also be present at low density and include *Potamogeton* spp. (pondweed), *Utricularia intermedia* (flat-leaved bladderwort), and *Najas flexilis* (flexuous naiad).

This type occurs in sheltered bays and shores and along slow moving streams throughout the Park. Wave exposure is typically low. Standing water is typically present up to 0.5 m deep. Substrate is clay or shallow peat over clay. The water regime is permanently flooded to intermittently exposed. Stands may be ephemeral due to fluctuating water levels in the large lakes.

CONSERVATION RANK G4 **DATABASE CODE** CEGL005258

CHARACTERISTIC SPECIES (n = 2, 3)

Forb

Acorus calamus (sweet flag) III.35, *Equisetum fluviatile* (water horsetail) III.45, *Polygonum lapathifolium* (nodding smartweed) V.7, *Sagittaria rigida* (sessile-fruited arrowhead) III.35, *Sium suave* (water-parsnip) V.2, *Typha* spp. (cattail) III.7

Graminoid

Carex rostrata (beaked sedge) III.15

RANGE

Voyageurs National Park

This community is fairly uncommon in the Park. It is most abundant in the larger bays like Daley and Tom Cod, though some stands may also be found in the many smaller bays throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This association is found in the northern Great Lakes region of the United States and into central Canada.

COMMENTS

Diagnostic features of the type include the herb layer dominated by *Acorus calamus* (sweet flag), *Equisetum fluviatile* (water horsetail), *Polygonum lapathifolium* (nodding smartweed), and *Sagittaria rigida* (sessile-fruited arrowhead). When dominated solely by *Equisetum fluviatile*, this type can grade into the Wiregrass Sedge Shore Fen (A11). The A27 type is most analogous to Ontario's W5 (Harris and others, 1996), though appears to include W6 as well.

MAP UNITS

This association is represented with the Deep Marsh Mosaic/Complex (DMX), which also includes other associations.

MINNESOTA STATE TYPE 2003

Spikerush - Bur Reed Marsh (Northern) (MRn93b)

76

A28 Wild Rice Marsh

Zizania (aquatica, palustris) Herbaceous Vegetation

Description

Cover of *Zizania palustris* (wild rice) in this community is highly variable, ranging from 20 to 100%. Other emergent species such as *Scirpus acutus* (hardstem bulrush) and *Scirpus validus* (softstem bulrush) may be present at low cover. Submerged and floating aquatic plants also are often present at low cover. *Nymphaea odorata* (fragrant white water lily) and *Nuphar lutea var. variegatum* (yellow water lily) are the most abundant floating aquatic plants. Depending on the site, any of a number of submerged aquatics also may be present, including *Vallisneria americana* (eelgrass), *Sparganium fluctuans* (floating bur-reed), *Najas flexilis* (flexuous naiad), *Potamogeton gramineus* (grass-leaved pondweed), *P. zosteriformis* (flat-stemmed pondweed), and *P. friesii* (Fries' pondweed).

Stands are typically found in sheltered and isolated bays along the shores of large lakes. These sites are permanently flooded with water 0.5–2 m deep. Substrate is deep muck or clay or a thin layer of muck over clay.

CONSERVATION RANK G? **DATABASE CODE** CEGL002382

CHARACTERISTIC SPECIES (n = 3, 19)

Forb

Potamogeton richardsonii (Richardson's pondweed) IV.7

Graminoid

Zizania palustris (wild rice) V.65

RANGE

Voyageurs National Park

This type is typically found in sheltered and isolated bays along the shores of the large lakes in the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This association is found in north-central United States and adjacent Canada.

COMMENTS

Diagnostic features of the type are open water and dominance by *Zizania palustris* (wild rice). The A28 type is similar to Ontario's W9 (Harris and others, 1996).

The natural and human caused fluctuation in water levels in the large lakes of Voyageurs National Park can have a significant impact on the presence of this community. Because the Wild Rice Marsh is dependent on a specific range of water levels, extreme wet or dry years may have an effect on the presence of this community in a particular area and throughout the Park. For this reason, the location of this community is constantly in flux, appearing in one place where in previous years it was absent and disappearing from where it may have been the previous year.

MAP UNITS

The Wild Rice Marsh (WRM) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX), each of which includes other associations.

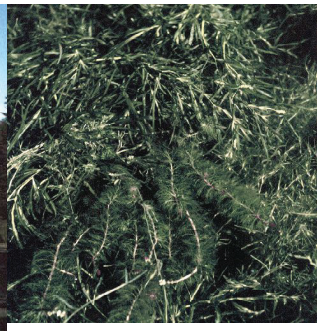
MINNESOTA STATE TYPE 2003

Not described.

78

A29 Midwest Pondweed Submerged Aquatic Wetland

Potamogeton spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation



Description

This community consists primarily of submerged aquatic plants but can contain <10% cover of floating aquatics. Percent cover of submerged aquatic vegetation is highly variable and ranges from 10 to 90%. Species composition and diversity are, likewise, highly variable. The most common species are *Ceratophyllum demersum* (coontail), *Najas flexilis* (flexuous naiad), *Potamogeton gramineus* (grass-leaf pondweed), and *Sparganium fluctuans* (floating bur-reed), but others include *Vallisneria americana* (eel-grass) *Potamogeton richardsonii* (Richardsons's pondweed), *P. zosteriformis* (flat-stemmed pondweed), *P. friesii* (Fries' pondweed), *Myriophyllum sibiricum* (Siberian water-milfoil), *Nymphaea odorata* (fragrant white water-lily), and *Nuphar lutea* var. *variegatum* (yellow water-lily). Examples of this type may be relatively species rich and contain nearly all of the above listed species or be species poor and contain only two or three species. *Valesneria americana*, in particular, can occasionally be found in nearly monotypic stands. Emergent species such as *Scirpus validus* (softstem bulrush), *S. acutus* (hardstem bulrush), and *Zizania palustris* (wild rice) may be present at low cover, especially in the large lakes.

Stands typically occur in fairly sheltered bays of the large lakes, in interior lakes or, rarely, in recent beaver floodings. They can also occur in more wave exposed sites on the large lakes where water depth is not limiting. Water depth is typically 0.5–2 m. The substrate is most commonly clay, though occasionally sand or, in less exposed sites, muck over clay.

CONSERVATION RANK G5Q **DATABASE CODE** CEGL002282

CHARACTERISTIC SPECIES (n = 5, 22)

Forb

Ceratophyllum demersum (coontail) IV.7, *Najas flexilis* (flexuous naiad) V.1, *Potamogeton gramineus* (grass-leaf pondweed) IV.15, *Sparganium fluctuans* (floating bur-reed) IV.7

RANGE

Voyageurs National Park

This community type is found throughout the Park area, typically in fairly sheltered bays of the large lakes, in interior lakes or, rarely, in recent beaver floodings or shallow, more exposed lakeshores. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This community is found in the north-central United States and in adjacent Canada.

COMMENTS

Diagnostic features of the type include dominance by submerged aquatics, especially *Ceratophyllum demersum* (coontail), *Najas flexilis* (flexuous naiad), *Potamogeton gramineus* (grass-leaf pondweed), and *Sparganium fluctuans* (floating bur-reed), and <10% cover of floating aquatics. Where floating aquatics, especially *Nymphaea odorata* (fragrant white water-lily) and *Nuphar lutea var variegatum* (yellow water-lily) increase in cover, this community grades into the Northern Water Lily Aquatic Wetland (A30). The A29 type is similar to Ontario's W1 and W3 (Harris and others, 1996).

The natural and human caused fluctuation in water levels in the large lake of Voyageurs National Park can have a significant impact on the structure, composition and presence of this community. Extreme wet or dry years may have an effect on the presence of this type by changing the dominance of floating, emergent and submerged vegetation.

MAP UNITS

The Midwest Pondweed Submerged Aquatic Wetland (PW) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX) and the Beaver Basin Break-up Mosaic (BBX), each of which also includes other associations.

MINNESOTA STATE TYPE 2003

Not described.

80

A30 Northern Water Lily Aquatic Wetland

Nymphaea odorata – Nuphar lutea (ssp. *pumila, variegata)* Herbaceous Vegetation

Description

This community is dominated by floating aquatics, mainly *Nymphaea odorata* (fragrant white water-lily), *Nuphar lutea* ssp. *variegata* (yellow pond-lily), and *Brasenia schreberi* (water shield). Cover of these floating aquatics is highly variable, ranging from 10 to 90%. *Nymphaea odorata* and *Nuphar lutea* ssp. *variegata* tend to dominate stands occurring in sheltered bays of lakes whereas *Brasenia schreberi* dominates beaver impoundments. Emergent vegetation may be present and is more common in beaver impoundments. Submerged aquatic plants often occur with the floating aquatics at 10–80% cover. The most abundant submerged aquatics in the lakes are *Potamogeton richardsonii* (Richardson's pondweed), *P. natans* (floating pondweed), *Myriophyllum sibiricum* (Siberian water-milfoil), *Vallisneria americana* (eelgrass), and *Najas flexilis* (flexuous naiad). In stands occurring in beaver impoundments, the most abundant submerged aquatic is *Utricularia vulgaris* (greater bladderwort).

This type occurs in sheltered bays of lakes and beaver impoundments. In confined basins, this community may also occur as an open water lag around emergent marsh communities. Wave exposure is low. Water depth is 0.25–2 m and substrate is typically muck, clay, or muck over clay. In stands occurring in beaver impoundments, standing dead trees and patches of emergent vegetation are common. The water regime is permanently flooded.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002562

CHARACTERISTIC SPECIES (n = 3, 43)

Forb

Brasenia schreberi (water-shield) V.65, *Potamogeton natans* (floating pondweed) IV.15

RANGE

Voyageurs National Park

This community type is found throughout the Park area, in sheltered bays of lakes and beaver impoundments. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Freshwater Marsh System.

Global

This association is found in the upper Great Lakes region of the United States and into central Canada.

COMMENTS

Diagnostic features of the type include >10% cover of *Nymphaea odorata* (fragrant white water-lily), *Nuphar lutea* ssp. *variegata* (yellow pond-lily), and *Brasenia schreberi* (water shield). Stands occurring in sheltered bays of the large lakes may resemble the Midwest Pondweed Submerged Aquatic Wetland (A29), but that type has <10% cover of floating aquatics. Many stands exist that are intermediate between these two types. When found in beaver impoundments, this type may occur with patches of Northern Sedge Wet Meadow (A22) or Leatherleaf - Sweet Gale Shore Fen (A9), which together may be mapped as Deep Marsh Complex (DMX). The A30 type is similar to Ontario's W4 (Harris and others, 1996).

Some examples of this community are subject to disturbance by beaver activity.

MAP UNITS

The Northern Water Lily Aquatic Wetland (WL) map unit represents this association. This association is also represented with the Deep Marsh Mosaic/Complex (DMX) and the Beaver Basin Break-up Mosaic (BBX), each of which also includes other associations.

MINNESOTA STATE TYPE 2003

Not described.

82

A31 Jack Pine / Lichen Rocky Barrens

Pinus banksiana - Mixed Conifer / *Cladina* spp. Nonvascular Vegetation

Description

In this community, trees, shrubs, and herbs form sparse layers over lichen-dominated bedrock. Jack pine is the only tree in the canopy. These trees are usually 10–15 m tall and are present at <25% cover. Vascular vegetation is usually present in clumps underneath the canopy of jack pine. The short scrub or shrubs northern pin oak, balsam fir, and/or *Amelanchier* spp. (serviceberry) may be absent or present at low cover. A dwarf-shrub layer is nearly always present, usually at 10–30% cover. The most abundant dwarf-shrubs are *Vaccinium angustifolium* (lowbush blueberry), *Juniperus communis* (common juniper), and *Prunus pumila* (sand cherry). The herb layer is poorly developed and may be absent. When present, it comprises 5–10% cover and primarily consists of *Danthonia spicata (poverty grass), Agrostis scabra* (rough bentgrass), *Corydalis sempervirens* (pale corydalis), *Polygonum cilinode* (fringed false buckwheat), *Selaginella rupestris* (rock spikemoss), and *Woodsia ilvensis* (rusty woodsia). The moss-lichen layer in this community typically comprises 30–50% cover, not including crustose lichens. Depending on substrate and slope, moss-lichen cover can be as low as 10%. Dominant species are the lichens *Cladina rangiferina, C. mitis, C. stellaris,* and *Stereocaulon* spp. and the mosses *Pleurozium schreberi*, *Polytrichum juniperinum, P. piliferum, Hedwigia ciliata,* and *Orthotrichum* spp.

This type occurs on ridge tops and high slopes with 40–80% exposed bedrock. Slopes are highly variable and range from gentle to very steep with variable aspects. Vegetation usually occurs on patches where soil has collected over bedrock. The soil in these patches are typically shallow (1–3 cm deep) loams. These sites are rapidly drained.

CONSERVATION RANK G3G5 **DATABASE CODE** CEGL002491

CHARACTERISTIC SPECIES (n = 1, 15)

Dwarf-shrub

Vaccinium angustifolium (lowbush blueberry) V.2

Forb

Corydalis sempervirens (pale corydalis) V.2, *Polygonum cilinode* (fringed false buckwheat) V.2, *Selaginella rupestris* (rock spikemoss) V.2, *Woodsia ilvensis* (rusty woodsia) V.2

Graminoid

Agrostis scabra (rough bent-grass) V.2, *Carex scoparia* (pointed-broom sedge) V.2, *Danthonia spicata* (poverty grass) V.2

RANGE

Voyageurs National Park

This community is common to some areas of the Park. In the northern part of the Park, it can be found near Anderson Bay and, less abundantly, near Daley Bay. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is found in northern Minnesota, Manitoba, and Ontario.

COMMENTS

Diagnostic features of the type are the dominance of moss-lichen (lichen and moss) vegetation, with <25% cover of trees or shrubs and only scattered herbaceous vegetation. When trees are present, jack pine is most typical. When total cover of all layers reaches 25%, this community grades into the Boreal Pine Rocky Woodland (A32). Ordination analysis showed this type to be most similar to A32. The A31 type has not been described in Ontario, but is most similar to V30 (Sims and others, 1997).

MAP UNITS

The Jack Pine/Lichen Rocky Barrens (JPL) map unit represents this association.

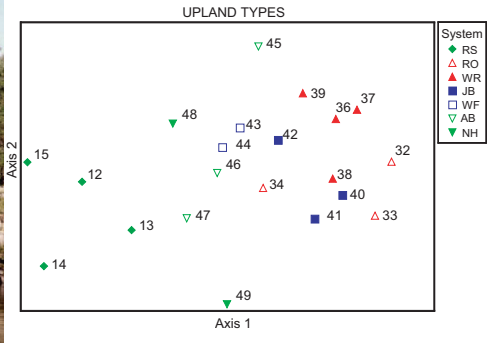
MINNESOTA STATE TYPE 2003

Crystalline Bedrock Outcrop (Northern) (ROn12b)

84

A32 Boreal Pine Rocky Woodland

Pinus banksiana - (Picea mariana, Pinus strobus) / Vaccinium spp. Rocky Woodland



Description

The tree canopy is variable, usually open, and often dominated by pine species, typically jack pine, but sometimes either red pine or white pine. Occasionally, black spruce is present. Canopy cover ranges from 30 to 60% with exposed bedrock preventing the complete closure of the canopy. Balsam fir, white pine and northern pin oak compose the open (20–30% cover) shrub layer, sometimes with *Salix humilis* (prairie willow). Dwarf-shrub cover ranges from 10 to 50%. The most common dwarf-shrub is *Vaccinium angustifolium* (lowbush blueberry); occasional associates include *Juniperus communis* (common juniper), *Diervilla onicera* (bush honeysuckle), *Amelanchier* spp. (serviceberry), *Rubus* spp. (blackberry), and *Arctostaphylos uva-ursi* (bearberry). The herb layer varies from virtually absent to 30% cover. Common herbs include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Maianthemum canadense* (Canada mayflower), *Melampyrum lineare* (cow-wheat), and *Danthonia spicata* (poverty grass).

Moss and lichen cover is highly variable, ranging from 20 to 90%, but the average is more commonly around 30%. The most abundant moss is *Pleurozium schreberi,* whereas the most abundant lichens are *Cladina rangiferina, C. mitis,* and *C. stellaris.*

This community is present on ridge tops and slopes with 5–50% exposed bedrock. Slopes are highly variable and range from flat to very steep with variable aspects. Vegetation is usually on patches where soil has collected over bedrock. The soil in these patches is typically shallow (1–4 cm deep) sandy loams with surficial rocks. These sites drain rapidly. Fires may occur within 50-year periods.

CONSERVATION RANK G4? **DATABASE CODE** CEGL002483

CHARACTERISTIC SPECIES (n = 16, 54)

Tree

Pinus banksiana (jack pine) III.15

Shrub

Abies balsamea (balsam fir) V.7, *Acer rubrum* (red maple) V.2, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) IV.4, *Pinus banksiana* (jack pine) IV.15, *P. strobus* (white pine) IV.7, *Populus tremuloides* (trembling aspen) IV.4, *Salix humilis* (prairie willow) IV.4

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.7, *Gaultheria procumbens* (wintergreen) V.2, *Juniperus communis* (bush juniper) IV.4, *Vaccinium angustifolium* (lowbush blueberry) V.25, *V. myrtilloides* (velvet-leaf blueberry) IV.2

Forb

Apocynum androsaemifolium (spreading dogbane) IV.2, *Aralia nudicaulis* (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.7, *Maianthemum canadense* (Canada mayflower) V.4, *Melampyrum lineare* (cow-wheat) V.1, *Pteridium aquilinum* (bracken fern) III.4

Graminoid

Danthonia spicata (poverty grass) V.7

RANGE

Voyageurs National Park

This type is present throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is in the northern Great Lakes region of the United States and in parts of central Canada.

COMMENTS

Diagnostic features of the type are the canopy of pines, including jack pine, red pine, or white pine, typically with <60% cover, and open lower layers caused by extensive areas of bedrock. Two subtypes were mapped, a pure jack pine phase and a red pine-white pine phase. Further review may show these to be two distinct associations. Stands on Dryweed Island (on greenstone bedrock) are distinct from the stands that occur in the rest of the Park, presumably because of the differences in underlying bedrock, but a wider survey is needed to verify these patterns. This type is similar to Jack Pine / Lichen Rocky Barrens (A31), but with >25% cover of trees, especially jack pine. When deciduous trees, especially northern pin oak, are co-dominant with jack pine, the community grades into the Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland (A33). The A32 type is similar to Ontario's V30 (Sims and others, 1997).

MAP UNITS

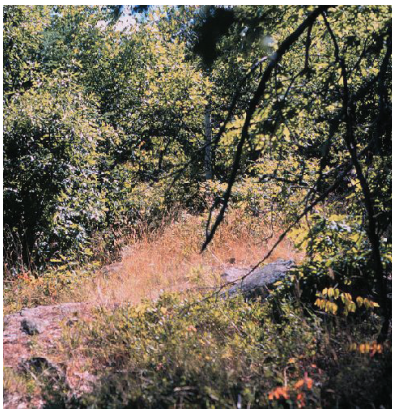
Two map units represent two structural variations of this one association: the Boreal Pine Rocky Woodland (jack pine phase; JPW) and the Boreal Pine Rocky Woodland (mixed pine phase; JPM).

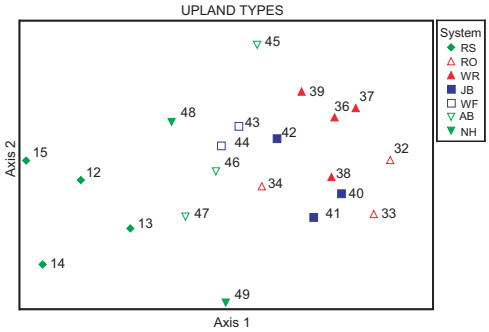
MINNESOTA STATE TYPE 2003

Jack Pine Woodland (Bedrock) (FDn22a)

A33 Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland

Quercus ellipsoidalis - Quercus macrocarpa - (Pinus banksiana) Rocky Woodland





Description

This community is dominated by a canopy of northern pin oak with occasional bur oak or jack pine. Jack pine, red pine or white pine can also form an emergent layer over the oak trees or be mixed with oaks in the canopy. Stands vary from pure deciduous to mixed evergreen-deciduous, and from 30% ("woodland" physiognomy) to 90% ("forest" physiognomy) cover. Canopy height may barely exceed 5 m, creating a scrub woodland appearance. Open bedrock ridges with oak may be found in a mosaic with more closed oak stands. The shrub layer may have 20–40% cover with *Corylus cornuta* (beaked hazelnut), *Viburnum rafinesquianum* (downy arrow-wood), northern pin oak, and *Amelanchier* spp. (serviceberry) most abundant. *Vaccinium angustifolium* (lowbush blueberry) is the most common dwarf-shrub; others include *Juniperus communis* (common juniper), *Prunus pumila* (sandcherry), *Arctostaphylos uva-ursi* (bearberry), and *Comptonia peregrina* (sweet fern). Cover of the herb layer is highly variable, ranging from 20 to 80%, with the most abundant herbs being *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Fragaria virginiana* (common strawberry), *Maianthemum canadense* (Canada mayflower), *Pteridium aquilinum* (bracken fern), *Danthonia spicata* (poverty grass), and *Oryzopsis asperifolia* (mountain rice-grass). The moss-lichen layer can be absent or present with up to 30% cover. In the open bedrock areas this layer consists mainly of the lichens *Cladina rangiferina, C. mitis, C. stellaris,* and, to a lesser degree, the mosses *Polytrichum juniperinum, P. piliferum, Hedwigia ciliata*, and *Orthotrichum* spp. Under the canopy of oaks, the moss-lichen layer consists primarily of *Pleurozium schreberi* and *Dicranum* spp.

This type occurs on ridge tops and high slopes, and some dry, flat, rocky areas. Slopes range from 0 to 20% with variable aspects. These sites are generally dry, well drained sites with exposed bedrock typical in the more open stands and commonly covering 10–30% of the ground. In some stands, exposed bedrock may be absent. In both cases, soils are fairly rocky, shallow loams, averaging 3–5 cm deep.

CONSERVATION RANK G? **DATABASE CODE** CEGL005246

CHARACTERISTIC SPECIES (n = 16, 66)

Shrub/Scrub

Abies balsamea (balsam fir) III.4, *Acer rubrum* (red maple) V.7, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) V.1, *Corylus cornuta* (beaked hazelnut) IV.4, *Pinus strobus* (white pine) V.4, *Quercus ellipsoidalis* (northern pin oak) V.45, *Viburnum rafinesquianum* (downy arrow-wood) III.4

Dwarf-shrub

Comptonia peregrina (sweet fern) III.4, *Diervilla lonicera* (bush honeysuckle) IV.2, *Gaultheria procumbens* (wintergreen) IV.2, *Rosa blanda* (and others) (rose) V.1, *Rubus strigosus* (red raspberry) IV.1, *Vaccinium angustifolium* (lowbush blueberry) V.15

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) V.15, *Fragaria virginiana* (common strawberry) IV.1, *Maianthemum canadense* (Canada mayflower) V.2, *Pteridium aquilinum* (bracken fern) V.15

Graminoid

Danthonia spicata (poverty grass) V.15, *Oryzopsis asperifolia (mountain rice-grass) V.7*

RANGE

Voyageurs National Park

This type occurs on ridge tops and high slopes throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is found in northern Minnesota, Ontario, and Manitoba.

COMMENTS

Diagnostic features of the type include the forest or woodland canopy consisting primarily of northern pin oak, with varying amounts of bur oak, jack pine, red pine, and white pine, and a rocky substrate, with herbaceous, moss, and lichen species adapted to dry conditions. Though there are some differences, quantitative analysis indicates that the floristic similarities between the oak woodland and the oak forest warrant including them as open and closed version of the same type. This type lacks balsam fir, whereas the Boreal Pine Rocky Woodland (A32) usually contains it. Stands of this type on Dryweed Island appear to be distinct from the stands occurring in the rest of the Park, presumably because of the differences in underlying greenstone bedrock. This type includes only those bur oak stands with exposed bedrock and woodland physiognomy. Forested mesic situations with bur oak are included in the Northern Bur Oak Mesic Forest (A49). The A33 type is most similar to Ontario's V3.3 (Sims and others, 1997).

MAP UNITS

Three map units represent three structural variations of this one association: the Northern Pin Oak-Bur Oak-(Jack Pine) Rocky Woodland (deciduous phase) (OW), the Northern Pin Oak-Bur Oak-(Jack Pine) Rocky Woodland (jack pine-oak phase) (JPOM), and the Northern Pin Oak-Bur Oak-(Jack Pine) Rocky Woodland (mixed pine-oak phase) (MPHW).

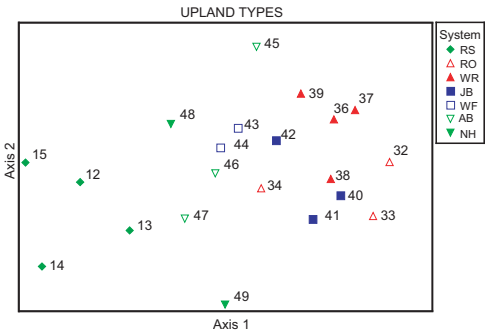
MINNESOTA STATE TYPE 2003

Pin Oak Woodland (Bedrock) (FDn22c)

88

A34 Mixed Aspen Rocky Woodland

Populus tremuloides - (Populus grandidentata) Rocky Woodland



Description

The vegetation structure in this community varies from more open canopy (20–60% cover), where bedrock outcrops occur, to closed canopy, where deeper soil pockets occur. The canopy usually consists of a mix of trembling aspen, paper birch, and occasionally big-tooth aspen. The subcanopy (usually about 30% cover) contains the same species in the canopy, as well as balsam fir, red maple, and less commonly, northern pin oak. These areas contain a short shrub layer of *Corylus cornuta* (beaked hazelnut) and aspen species, with cover ranging from 20 to 90%. The herb layer in these patches consists of *Aralia nudicaulis* (wild sarsaparilla), *Pteridium aquilinum* (bracken fern), and *Aster macrophyllus* (large-leaved aster) with cover typically in the 60–70% range. The bedrock outcrops often contain a low cover of *Vaccinium* spp. (blueberry). The herb layer associated with bedrock typically contains *Woodsia ilvensis* (rusty woodsia), *Schizachne purpurascens* (false melic grass), and *Agropyron trachycaulum* (slender wheatgrass), with cover usually low (<25%). These bedrock areas may also contain a low moss-lichen cover of *Pleurozium schreberi*, *Cladina rangiferina, C. mitis,* and *C. stellaris*.

This community occurs on bedrock ridges with shallow soils. Soils range from nonexistent on bedrock openings to 8–12 cm loams or sandy loams in low areas where soil has developed. Slopes are generally gentle (1–10%) with variable aspects. Exposed bedrock ranges from 5 to 20%. These sites are rapidly drained.

CONSERVATION RANK G?

DATABASE CODE CEGL002487

CHARACTERISTIC SPECIES (n = 13, 19)

Tree

Populus tremuloides (trembling aspen) V.25

Shrub

Abies balsamea (balsam fir) V.4, *Acer rubrum* (red maple) V.15, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) IV.7, *Cornus rugosa* (round-leaved dogwood) IV.4, *Corylus cornuta* (beaked hazelnut) V.25, *Populus tremuloides* (trembling aspen) V.15, *Viburnum rafinesquianum* (downy arrow-wood) V.4

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) IV.1, *Rosa blanda* (and others) (rose) IV.1, *Rubus strigosus* (red raspberry) V.4, *Vaccinium angustifolium* (lowbush blueberry) V.4

Forb

Apocynum androsaemifolium (spreading dogbane) IV.1, *Aralia nudicaulis* (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.55, *Cornus canadensis* (bunchberry) IV.1, *Fragaria virginiana* (common strawberry) IV.2, *Galium triflorum* (three-flowered bedstraw) IV.1, *Maianthemum canadense* (Canada mayflower) V.2, *Pteridium aquilinum* (bracken fern) V.25, *Streptopus roseus* (rosey twisted-stalk) IV.1, *Trientalis borealis* (starflower) IV.1

RANGE

Voyageurs National Park

This type occurs in localized upland areas throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is found in the northern Great Lakes region of the United States and parts of central Canada.

COMMENTS

Diagnostic features of the type are the canopy of trembling aspen, paper birch, and occasionally big-tooth aspen, with <60% cover, and canopy closure prevented by the presence of exposed bedrock. When canopy cover is >60% and canopy closure is not prevented by the presence of exposed bedrock, the community is typically more moist and species-rich and likely to resemble the Aspen - Birch / Boreal Conifer Forest (A46). Vegetation indicative of exposed bedrock conditions should be present for the stand to be considered a Mixed Aspen Rocky Woodland. If woodland physiognomy is evident and the canopy is a mixture of aspen/birch and other conifers, this type can grade into Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland (A33), or the Jack Pine - Aspen / Bush Honeysuckle Forest (A41), but those types have at least 20% oak or jack pine cover, respectively, in the canopy. The A34 type has not been described in Ontario (Sims and others, 1997).

MAP UNITS

The Mixed Aspen Rocky Woodland (ABW) map unit represents this association.

MINNESOTA STATE TYPE 2003

Aspen - Birch Woodland (FDn33b)

90

A35 Boreal Hazelnut - Serviceberry Rocky Shrubland

Corylus cornuta - Amelanchier spp. - *Prunus virginiana* Rocky Shrubland

Description

This shrub community usually contains a dense (70–90% cover) shrub canopy of *Acer spicatum* (mountain maple), trembling aspen, *Corylus cornuta* (beaked hazelnut) and/or balsam fir. Trees may be absent or present with <25% cover. Where the canopy of tall shrubs is more open, short shrubs such as *Rubus strigosus* (red raspberry), *Taxus canadensis* (canada yew), *Rubus pubescens* (dwarf raspberry), and *Juniperus communis* (common juniper) exist at low to moderate cover. Density and composition of the herb layer is highly variable. The most common species include *Aster macrophyllus* (large-leaved aster), *Pteridium aquilinum* (bracken fern) and *Polygonum cilinode* (fringed false buckwheat). On wetter sites, herbaceous species such as *Calamagrostis canadensis* (bluejoint) and *Scirpus cyperinus* (wool-grass) may dominate.

Stands occur on a wide variety of slopes, soils, topographic positions and moisture regimes. This community typically arises because of natural or human disturbance, most commonly beavers, fire, logging and blowdowns. It can also occur without disturbance, usually on ridgetops. These sites, however, are usually so small that they are often treated as inclusions of other communities.

CONSERVATION RANK G?

DATABASE CODE CEGL005197

CHARACTERISTIC SPECIES (n = 3, 34)

Shrub

Acer spicatum (mountain maple) IV.7, *Amelanchier* spp. (serviceberry) V.15, *Corylus cornuta* (beaked hazelnut) V.45

Dwarf-shrub

Rubus strigosus (red raspberry) V.65

Forb

Polygonum cilinode (fringed false buckwheat) IV.7

Graminoid

Calamagrostis canadensis (bluejoint) V.4

RANGE

Voyageurs National Park

This type occurs widely in small pockets throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is found in the northern Great Lakes region of the United States and into central Canada.

COMMENTS

Diagnostic features of the type are the upland deciduous shrubs with >25% cover and trees with <25% cover. These stands often strongly resemble forest types that match the previous tree canopy that existed on the site, as trees re-invade or mature on the site, this type may succeed to that forest type. The most similar forest types are the spruce-fir and aspen types (A43–A47). This type can have patches of exposed bedrock, but tree canopy closure is not prevented by it. The A35 type, though not described in northwestern Ontario, is similar to Ontario's V30 (Sims and others, 1997).

This community typically arises because of a wide variety of disturbances, but few plots were sampled, so it was not included in the ordination. Nor does the Minnesota state classification include this seral shrub type, though it may be a mesic subtype of their Bedrock Shrubland (ROn23). Outside the Park (and in some locations within the Park) this shrub community arises after logging has removed the tree canopy. In these circumstances, the shrubs are typically dense trembling aspen saplings. This community is also common on slopes above beaver ponds where beaver have removed all or most of the tree canopy. In these situations, the shrubs are usually dense *Corylus cornuta* (beaked hazelnut) and *Acer spicatum* (mountain maple). This type can also occur on ridge tops, high slopes and other places where high winds have blown down the trees in the canopy. Finally, this community also arises after fire has killed the trees in the canopy.

MAP UNITS

The Boreal Hazelnut-Serviceberry Rocky Shrubland (UBS) map unit represents this association.

MINNESOTA STATE TYPE 2003

No equivalent.

92

A35a Poverty Grass Granite Barrens

Danthonia spicata - Poa compressa Granite Herbaceous Vegetation

Description

The vegetation is open and dominated by graminoids, often exceeding 60% in cover. Characteristic herbaceous dominants include a mix of native and exotic species. Dominant grasses include *Agrostis scabra* (rough bent-grass), *Danthonia spicata* (poverty grass), *Phleum pratense* (timothy grass), and *Poa compressa* (canada bluegrass). The latter two grasses are exotics. Dominant forbs include *Solidago* spp. (goldenrod).

Sites are typically disturbed, shallow soil sites. Stands occur on granite or metamorphic rocks. Soils are thin and acidic.

CONSERVATION RANK G? **DATABASE CODE** CEGL005157

CHARACTERISTIC SPECIES (n = 0, 3)

Forb

Solidago spp. (goldenrod)

Graminoid

Agrostis scabra (rough bent-grass), *Danthonia spicata* (poverty grass), *Phleum pratense* (timothy grass), *Poa compressa* (canada bluegrass)

RANGE

Voyageurs National Park

This type primarily represents localized disturbed sites around abandoned cottages in and around the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Rocky Outcrop / Woodland System.

Global

This association is found in Minnesota, Michigan, and Ontario.

COMMENTS

Distinctive features of this type include the grass dominance of *Agrostis scabra* (rough bent-grass), *Danthonia spicata* (poverty grass), *Phleum pratense* (timothy grass), and *Poa compressa* (canada bluegrass). A variety of native and exotic species are present. This type is unlike any other in the Park, and is most often found on disturbed sites in and near abandoned cottages. It occurs mainly on private lands, so quantitative sampling was not possible, and it was not included in the quantitative analyses. It bears some resemblance to the Boreal Hazelnut - Serviceberry Rocky Shrubland (A35) in being a disturbance type. The A35a type has not been described in Ontario (Sims and others, 1997).

MAP UNITS

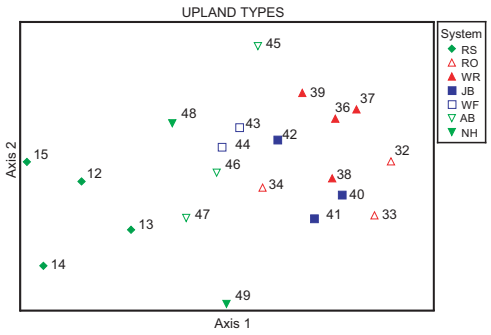
The Poverty Grass Granite Barrens (MGF) map unit represents this association.

MINNESOTA STATE TYPE 2003

No equivalent.

A36 Red Pine / Blueberry Dry Forest

Pinus resinosa / Vaccinium spp. Forest



Description

Canopy coverage in this type is typically 70–90% and can consist either solely of red pine or a mixture of red and white pine. Red pine is often the only conifer in the canopy on sites with rockier, more shallow soils. On dry-mesic sites, however, white pine can comprise up to 40% of the canopy. Trembling aspen and paper birch are minor components, with <25% relative cover. Canopy height can reach 20–35 m in more mature stands. Closed canopy stands may have a sparse understory vegetation. If present, the shrub layer consists of balsam fir, *Corylus cornuta* (beaked hazelnut), red maple, white pine and *Amelanchier* spp. (serviceberry). *Vaccinium angustifolium* (lowbush blueberry) and *V. myrtilloides* (velvet-leaf blueberry) are common dwarf-shrubs. Presence of herbaceous species is highly variable ranging from virtually absent to 90% cover (average = 40%), but the layer is species poor. The most abundant species are *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Cornus canadensis* (bunchberry), *Maianthemum canadense* (Canada mayflower), and *Pteridium aquilinum* (bracken fern). Mosses tyically have 10–20% cover, but can occasionally reach 70–80%. Important moss species include *Pleurozium schreberi, Dicranum polysetum, D. scoparium,* and *D. ontariense*.

Though occurring occasionally on flat terrain, stands more often occur on gentle to moderate (5– 20%) slopes with variable aspects. The substrate is typically dry to dry-mesic and very rocky. Soils are loams or sandy loams and range from 3 to 20 cm in depth underlain by bedrock or coarse loose rock. Fires may occur within 50–200-year periods.

CONSERVATION RANK G3 **DATABASE CODE** CEGL002443

CHARACTERISTIC SPECIES (n = 8, 32)

Tree

Pinus resinosa (red pine) V.45, *P. strobus* (white pine) V.25

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.7, *Amelanchier* spp. (serviceberry) V.4, *Betula papyrifera* (paper birch) V.7, *Corylus cornuta* (beaked hazelnut) IV.15, *Picea glauca* (white spruce) V.2, *P. mariana* (black spruce) III.4, *Pinus resinosa* (red pine) III.7, *P. strobus* (white pine) V.7, *Populus tremuloides* (trembling aspen) IV.4

Dwarf-shrub

Chimaphila umbellata (pipsissewa) IV.1, *Diervilla lonicera* (bush honeysuckle) IV.1, *Gaultheria procumbens* (wintergreen) IV.1, *Lonicera canadensis* (fly honeysuckle) IV.1, *Rubus strigosus* (red raspberry) IV.1, *Vaccinium angustifolium* (lowbush blueberry) V.2, *V. myrtilloides* (velvet-leaf blueberry) IV.1

Forb

Aralia nudicaulis (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.15, *Clintonia borealis* (bluebead lily) IV.1, *Cornus canadensis* (bunchberry) V.4, *Goodyera tesselata* (tesselate rattlesnake-plantain) IV.1, *Linnaea borealis* (twinflower) V.2, *Maianthemum canadense* (Canada mayflower) V.7, *Polypodium virginianum* (common polypody) V.2, *Pteridium aquilinum* (bracken fern) V.7, *Trientalis borealis* (starflower) IV.2

Graminoid

Oryzopsis asperifolia (mountain rice-grass) III.4

RANGE

Voyageurs National Park

This type is found throughout the Park on dry, rocky sites with gentle to moderate (5–20%) slopes and variable aspects. Smaller stands of this type typically exist on small islands within the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Pine - (Oak) Forest System.

Global

This community is found in the northern Great Lakes region of the United States and central Canada.

COMMENTS

Diagnostic features of the type include the canopy of red pine, with <40% white pine in the canopy. This type is very similar to the Red Pine - Aspen - Birch Forest (A37), which is somewhat drier and has a greater proportion of aspen and other deciduous hardwood trees. The two types could be treated as subtypes of a broader type. On dry-mesic sites, this type can grade into the White Pine / Mountain Maple Mesic Forest (A39), where white pine in the canopy reaches >60% cover. The A36 type is similar to Ontario's V27 (Sims and others, 1997).

MAP UNITS

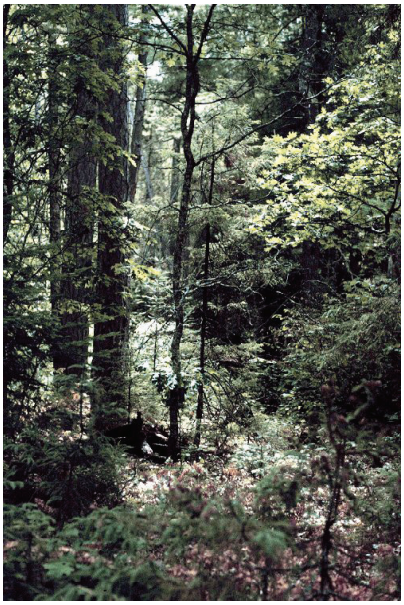
The Red Pine/Blueberry Dry Forest (RP) map unit represents this association. This association is also mapped with the White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit when red pine stands are in tight mosaic pattern with aspen stands.

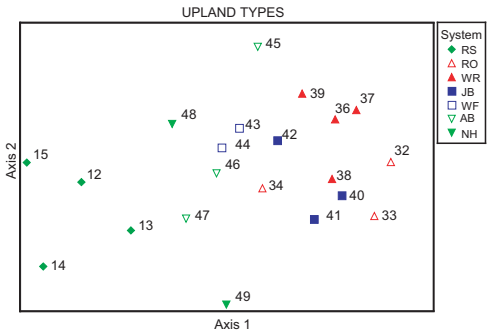
MINNESOTA STATE TYPE 2003

Red Pine - White Pine Woodland (Canadian Shield) (FDn32a)

A37 Red Pine - Aspen - Birch Forest

Pinus resinosa - Populus tremuloides / Diervilla lonicera - Vaccinium spp. Forest





Description

Stands contain a mix of deciduous and evergreen trees, comprised mainly of red pine, with occasional black spruce. Hardwoods include trembling aspen, paper birch, and some big-tooth aspen. The shrub and herb layer varies from dense to open. Tall and dwarf-shrubs include balsam fir, *Acer spicatum* (mountain maple), *Amelanchier* spp. (serviceberry), *Corylus cornuta* (beaked hazelnut), *Diervilla lonicera* (bush honeysuckle), *Lonicera canadensis* (fly honeysuckle), *Vaccinium angustifolium* (lowbush blueberry), and *V. myrtilloides* (velvet-leaf blueberry). Herbs include *Aster macrophyllus* (large-leaved aster), *Aralia nudicaulis* (wild sarsaparilla), *Cornus canadensis* (bunchberry), *Maianthemum canadense* (Canada mayflower), and *Pteridium aquilinum* (bracken fern). Large patches of feathermoss can develop on the forest floor. Moss species include *Dicranum polysetum* and *Pleurozium schreberi* (Sims and others, 1989, McCarthy and others, 1994).

Stands are found on well-drained upland sites on a variety of landforms. Soils are coarse sandy, and shallow to deep. Fires may occur within 50–200-year periods.

CONSERVATION RANK G? **DATABASE CODE** CEGL002520

CHARACTERISTIC SPECIES (n = 2, 4)

Tree

Picea mariana (black spruce) III.7, *Pinus resinosa* (red pine) V.75, *Populus grandidentata* (big-tooth aspen) III.7, *Quercus ellipsoidalis* (northern pin oak) III.7

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.4, *Amelanchier* spp. (serviceberry) V.4, *Corylus cornuta* (beaked hazelnut) V.7, *Picea mariana* (black spruce) V.15, *Pinus resinosa* (red pine) III.7, *P. strobus* (white pine) V.4, *Populus grandidentata* (big-tooth aspen) III.7, *P. tremuloides* (trembling aspen) V.1, *Quercus ellipsoidalis* (northern pin oak) III.7

Dwarf-shrub

Chimaphila umbellata (pipsissewa) V.4, *Gaultheria procumbens* (wintergreen) V.4, *Lonicera canadensis* (fly honeysuckle) V.2, *Rosa blanda* (and others) (rose) V.1, *Rubus strigosus* (red raspberry) V.4, *Vaccinium angustifolium* (lowbush blueberry) V.15, *V. myrtilloides* (velvet-leaf blueberry) V.2

Forb

Aralia nudicaulis (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.15, *Cornus canadensis* (bunchberry) V.4, *Linnaea borealis* (twinflower) V.4, *Lycopodium clavatum* (running clubmoss) V.2, *Maianthemum canadense* (Canada mayflower) V.4, *Polypodium virginianum* (common polypody) V.1, *Pteridium aquilinum* (bracken fern) V.15, *Trientalis borealis* (starflower) V.2

Graminoid

Danthonia spicata (poverty grass) V.4

RANGE

Voyageurs National Park

This type is found throughout the Park, typically as a mix or as part of a mosaic of pure red or white pine and pure aspen-birch types. Smaller stands of this type typically exist on small islands within the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Pine - (Oak) Forest System.

Global

This association is found in the northern Great Lakes region of the United States and in central Canada.

COMMENTS

This type is characterized by a mix of red pine and hardwoods, with somewhat dry indicator species such as *Pteridium aquilinum* (bracken fern). During mapping, this type was not distinguished from a mosaic of the Red Pine / Blueberry Dry Forest (A36) and the Aspen - Birch / Boreal Conifer Forest (A46). The type is similar to Ontario's V13 (Sims and others, 1997).

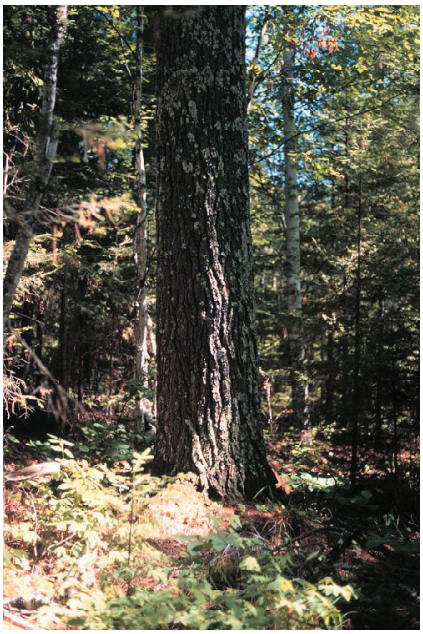
MAP UNITS

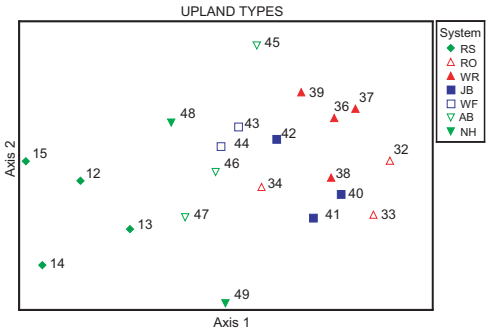
The White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit represents this association and the White Pine - Aspen - Birch Forest association (A38). This map unit also represents tight mosaic forest stands of Red Pine / Blueberry Dry Forest association (A36) and Aspen - Birch / Boreal Conifer Forest association (A46) and/or Aspen - Birch - Red Maple Forest association (A47). The White Pine / Mountain Maple Mesic Forest association (A39) can also be a part of this mosaic.

(Continued on page 123)

A38 White Pine - Aspen - Birch Forest

Pinus strobus - Populus tremuloides / Corylus cornuta Forest





Description

This community contains a mixed evergreen-deciduous canopy, with white pine often forming a supercanopy over paper birch or trembling aspen. These same species can occur as co-dominants in the canopy, sometimes with red and jack pine. The shrub/sapling layer contains balsam fir, red maple, *Amelanchier* spp. (serviceberry), *Cornus rugosa* (round-leaved dogwood), *Corylus cornuta* (beaked hazelnut), and *Viburnum rafinesquianum* (downy arrow-wood). In the dwarf-shrub layers, species include *Diervilla lonicera* (bush honeysuckle), *Rosa blanda* (and others) (rose), *Rubus strigosus* (red raspberry), and *Vaccinium angustifolium* (lowbush blueberry). Herb species include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Maianthemum canadense* (Canada mayflower), and *Pteridium aquilinum* (bracken fern). Typical mosses include *Pleurozium schreberi, Dicranum polysetum,* and *D. flagellare.*

Stands are found on a variety of slope positions on shallow to deep (>60 cm), dry-mesic to mesic, rapidly drained soils. Fires may occur within 50–200-year periods.

CONSERVATION RANK G4? **DATABASE CODE** CEGL002479

CHARACTERISTIC SPECIES (n = 7, 23)

Tree

Pinus strobus (white pine) V.35

Shrub

Abies balsamea (balsam fir) III.4, *Acer rubrum* (red maple) IV.4, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) V.4, *Cornus rugosa* (round-leaved dogwood) IV.4, *Corylus cornuta* (beaked hazelnut) V.15, *Pinus strobus* (white pine) V.15, *Viburnum rafinesquianum* (downy arrow-wood) IV.7

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.4, *Rosa blanda* (and others) (rose) IV.1, *Rubus strigosus* (red raspberry) IV.7, *Vaccinium angustifolium* (lowbush blueberry) V.7

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) V.25, *Galium triflorum* (three-flowered bedstraw) IV.1, *Lathyrus ochroleucus* (pale vetchling) IV.1, *Maianthemum canadense* (Canada mayflower) V.7, *Pteridium aquilinum* (bracken fern) IV.15

Graminoid

Oryzopsis asperifolia (mountain rice-grass) III.4

RANGE

Voyageurs National Park

This type is found throughout the Park, typically as part of a mix or as a mosaic of pure red or white pine and pure aspen-birch types. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Pine - (Oak) Forest System.

Global

This association is found in the upper Great Lakes region of the United States and south-central regions of Canada.

COMMENTS

Diagnostic features of this type include the dominance of white pine, sometimes co-dominated by red and jack pine (suggesting a somewhat dry set of site conditions), mixed with hardwoods, such as paper birch and trembling aspen. Where jack pine is more common, the type may grade into Jack Pine / Balsam Fir Forest (A40). During mapping, this type was not distinguished from a mosiac of the White Pine / Mountain Maple Mesic Forest (A39) and the Aspen - Birch / Boreal Conifer Forest (A46); this type is drier than either of those types. The A38 type is similar to Ontario's V12 (Sims and others, 1997).

MAP UNITS

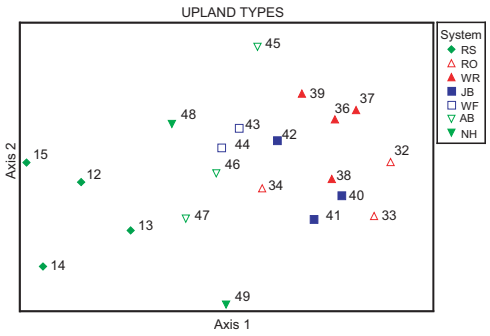
The White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit represents this association and the Red Pine - Aspen - Birch Forest association (A37). This map unit also represents tight mosaic forest stands of White Pine / Mountain Maple Mesic Forest association (A39) and Aspen - Birch / Boreal Conifer Forest association (A46) and/or Aspen - Birch - Red Maple Forest association (A47). The Red Pine / Blueberry Dry Forest association (A36) can also be a part of this mosaic.

MINNESOTA STATE TYPE 2003

Red Pine - White Pine Woodland Balsam Fir Subtype (FDn33a1)

A39 White Pine / Mountain Maple Mesic Forest

Pinus strobus / Acer spicatum - Corylus cornuta Forest



Description

The canopy of this type commonly consists of a mix of white pine and red pine, with white pine comprising at least 40% of the relative cover. Total canopy cover is 60–90% with canopy tree height typically 15–20 meters. A shrub layer is present at between 20 and 50% cover, and is composed of balsam fir, *Acer spicatum* (mountain maple), *Corylus cornuta* (beaked hazelnut), red maple, and *Amelanchier* spp. (serviceberry). The dwarf blueberries, *Vaccinium angustifolium* (lowbush blueberry) and *V. myrtilloides* (velvet-leaf blueberry) may also be present at low cover, along with *Diervilla lonicera* (bush honeysuckle), *Lonicera canadensis* (fly honeysuckle), and *Rubus strigosus* (red raspberry). The herb layer is typically sparse with low to moderate cover and low species diversity. The most common species are *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Clintonia borealis* (bluebead lily), *Cornus canadensis* (bunchberry), *Galium triflorum* (three-flowered bedstraw), *Linnaea borealis* (twinflower), *Lycopodium obscurum* (and others) (princess-pine), *Maianthemum canadense* (Canada mayflower), and *Trientalis borealis* (starflower). The cover of mosses is highly variable ranging from nearly absent to 90%. The most common species are *Pleurozium schreberi, Dicranum scoparium, D. polysetum,* and *D. ontariense*.

Stands generally occur on gentle slopes with variable aspects. Surficial rocks and small patches of exposed bedrock are occasionally present. Soils are somewhat shallow (3–10 cm deep) loams or sandy loams. A duff layer of pine needles is common. These sites are well to moderately well drained. Fires may occur within 50–200-year periods.

CONSERVATION RANK G3G4 **DATABASE CODE** CEGL002445

CHARACTERISTIC SPECIES (n = 12, 26)

Tree

Pinus resinosa (red pine) V.25, *Pinus strobus* (white pine) V.35

Shrub

Abies balsamea (balsam fir) V.45, *Acer rubrum* (red maple) V.15, *Acer spicatum* (mountain maple) IV.4, *Amelanchier* spp. (serviceberry) IV.2, *Betula papyrifera* (paper birch) III.7, *Corylus cornuta* (beaked hazelnut) V.15, *Picea glauca* (white spruce) IV.1, *Pinus strobus* (white pine) V.7

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.4, *Lonicera canadensis* (fly honeysuckle) V.4, *Rubus strigosus* (red raspberry) V.4, *Vaccinium angustifolium* (lowbush blueberry) IV.7, *Vaccinium myrtilloides* (velvet-leaf blueberry) IV.4

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) V.15, *Clintonia borealis* (bluebead lily) V.2, *Cornus canadensis* (bunchberry) V.4, *Galium triflorum* (three-flowered bedstraw) V.1, *Linnaea borealis* (twinflower) V.4, *Lycopodium obscurum* (and others) (princess-pine) IV.1, *Maianthemum canadense* (Canada mayflower) V.7, *Rubus pubescens* (dwarf raspberry) IV.1, *Streptopus roseus* (rosey twisted-stalk) IV.1, *Trientalis borealis* (starflower) V.1

Graminoid

Oryzopsis asperifolia (mountain rice-grass) III.4

RANGE

Voyageurs National Park

This community occurs on dry mesic sites throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Pine - (Oak) Forest System.

Global

This community is found in the upper Great Lakes region of the United States and into southern and central Canada.

COMMENTS

Diagnostic features of the type are forest canopy consisting of >40% white pine, red pine as a common associate, and a relatively mesic set of indicator ground-layer species. This community also generally occupies more mesic sites than the Red Pine / Blueberry Dry Forest (A36). Where hardwoods, especially trembling aspen and paper birch, are also present in the canopy at >25% cover, this type grades into the White Pine - Aspen - Birch Forest (A38), but that type is typically drier, occasionally with a component of jack pine. The A39 type is similar to Ontario's V26 (Sims and others, 1997).

MAP UNITS

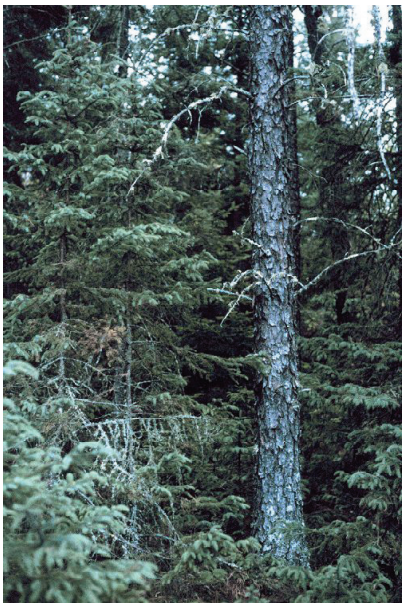
The White Pine/Mountain Maple Mesic Forest (WP) map unit represents this association. This association is also mapped with the White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit when white pine stands are in tight mosaic pattern with aspen stands.

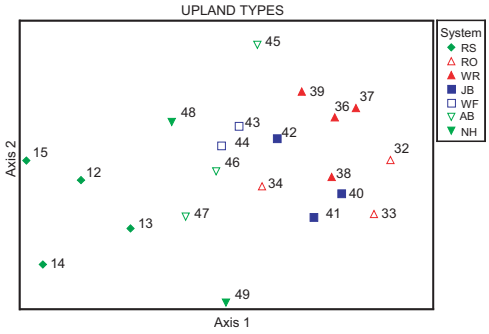
MINNESOTA STATE TYPE 2003

White Pine - Red Pine Forest (FDn43a)

A40 Jack Pine / Balsam Fir Forest

Pinus banksiana / Abies balsamea Forest





Description

The canopy of this community usually consists solely of jack pine and ranges from 60 to 80% cover. The subcanopy is most often absent, but in some cases may be a 20–30% cover of balsam fir, paper birch, or black spruce. The shrub layer ranges from absent to 20–30% cover, consisting of balsam fir, *Amelanchier* spp. (serviceberry), and *Corylus cornuta* (beaked hazelnut). The dwarf-shrub layer is usually dominated by *Vaccinium angustifolium* (lowbush blueberry). Herbaceous cover is highly variable, ranging from 30 to 80%, and consists mainly of *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Cornus canadensis* (bunchberry), *Lycopodium clavatum* (running clubmoss), *Maianthemum canadense* (Canada mayflower), and *Oryzopsis asperifolia* (mountain rice-grass). The abundance of the moss-lichen layer, which usually consists mainly of *Pleurozium schreberi*, is highly variable. Stands with 90% cover of *P. schreberi*, as well as stands lacking this moss, are both common.

Stands occur on flat or slightly sloping terrain with variable aspects. Soils are typically fairly well drained loams or sandy loams ranging from 5 to 30 cm in depth. Surficial rocks and bedrock outcrops are common. In some stands, coarse woody debris is abundant. Fires may occur within 50-year periods.

CHARACTERISTIC SPECIES (n = 3, 32)

Tree

Pinus banksiana (jack pine) V.65

Shrub

Abies balsamea (balsam fir) V.7, *Acer rubrum* (red maple) V.4, *Amelanchier* spp. (serviceberry) V.15, *Betula papyrifera* (paper birch) V.7, *Corylus cornuta* (beaked hazelnut) IV.7, *Populus tremuloides* (trembling aspen) V.4, *Salix humilis* (prairie willow) V.2, *Sorbus decora* (and others) (mountain-ash) V.1

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.4, *Gaultheria procumbens* (wintergreen) V.1, *Rubus strigosus* (red raspberry) V.2, *Vaccinium angustifolium* (lowbush blueberry) V.15, *V. myrtilloides* (velvet-leaf blueberry) V.1

Forb

Aralia nudicaulis (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.25, *Cornus canadensis* (bunchberry) V.15, *Dryopteris carthusiana* (and others) (spinulose fern) V.1, *Linnaea borealis* (twinflower) V.2, *Lycopodium clavatum* (running clubmoss) V.4, *Maianthemum canadense* (Canada mayflower) V.4, *Rubus pubescens* (dwarf raspberry) V.2, *Trientalis borealis* (starflower) V.2

Graminoid

Oryzopsis asperifolia (mountain rice-grass) IV.7

RANGE

Voyageurs National Park

This community type occurs throughout the Park on well-drained, somewhat rocky upland sites. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Jack Pine - Black Spruce Forest System.

Global

This community is found in northeastern Minnesota and northwestern Ontario, and probably elsewhere in central Canada.

COMMENTS

Diagnostic features of the type include the canopy consisting solely of jack pine, with canopy closure not prevented by the presence of exposed bedrock. This type is somewhat similar to drier jack pine types, such as the Boreal Pine Rocky Woodland (A32) or the Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland (A33), but lacks the dry indicator species, open bedrock, or oak species found in those types. Some stands in the Park may represent a Jack Pine / Feathermoss type similar to Black Spruce / Feathermoss Forest Type (A42), but are not separated out here. Aspen species may rarely be found mixed in the canopy with jack pine, and may grade into Jack Pine - Aspen / Bush Honeysuckle Forest (A41), which is uncommon in the Park. More commonly, this type is found in a mosaic pattern with Aspen - Birch / Boreal Conifer Forest (A46), in which this type occupies upper ridges and the aspen forest occupies mesic depressions. The A40 type is similar to Ontario's V28 (Sims and others, 1997).

(Continued on page 124)

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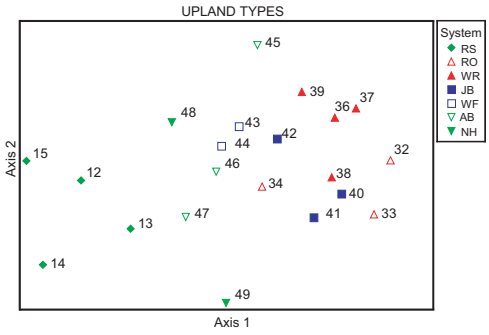
A41 Jack Pine - Aspen / Bush Honeysuckle Forest

Pinus banksiana - Populus tremuloides / Diervilla lonicera Forest



Description

The canopy layer in this community is a mix of jack pine and trembling aspen, with lesser amounts of balsam fir, paper birch, white spruce, and black spruce. Tree density and crown spacing may be moderately dense to dense, but sufficient light penetrates to permit the growth of a vigorous shrub layer. The most common among these are balsam fir, *Corylus cornuta* (beaked hazelnut), *Diervilla lonicera* (bush honeysuckle). *Vaccinium angustifolium* (lowbush blueberry) is the common dwarf-shrub. The herb layer is strongly dominated by *Aster macrophyllus* (large-leaved aster) and *Pteridium aquilinum* (bracken fern), *Cornus canadensis* (bunchberry) and *Rubus pubescens* (dwarf raspberry) are less common.

Stands are found on generally level sandy outwash plains or moderate slopes. Soils are fresh to dry, deep, sandy loams, loams, and fine sands. Fires may occur within 50-year periods.

CONSERVATION RANK G4G5 **DATABASE CODE** CEGL002518

CHARACTERISTIC SPECIES (n = 1, 18)

Tree

Pinus banksiana (jack pine) V.35, *Populus tremuloides* (trembling aspen) V.15

Shrub

Abies balsamea (balsam fir) V.15, *Betula papyrifera* (paper birch) V.15, *Picea glauca* (white spruce) V.15

Dwarf-shrub

Vaccinium angustifolium (lowbush blueberry) V.4

Forb

Aster macrophyllus (large-leaved aster) V.85, *Cornus canadensis* (bunchberry) V.15, *Pteridium aquilinum* (bracken fern) V.15, *Rubus pubescens* (dwarf raspberry) V.4

RANGE

Voyageurs National Park

Distribution of this type is often embedded within mosaics of Jack Pine / Balsam Fir Forest (A40) and Aspen-Birch / Boreal Conifer Forest (A46). Both of those types are widespread throughout the Park For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Jack Pine - Black Spruce Forest System.

Global

This community is found in the northen Great Lakes region of the United States and in central Canada's boreal region.

COMMENTS

Diagnostic features of the type include a canopy consisting of a mix of jack pine and trembling aspen, with canopy closure not prevented by the presence of exposed bedrock. Where jack pine becomes dominant, this type may grade into Jack Pine / Balsam Fir Forest (A40), and this type may really be a phase of that type. Spatially, this type can resemble a mosaic pattern of Aspen - Birch / Boreal Conifer Forest (A46) and Jack Pine / Balsam Fir Forest (A40). The A41 type is similar to Ontario's V17 (Sims and others, 1997).

MAP UNITS

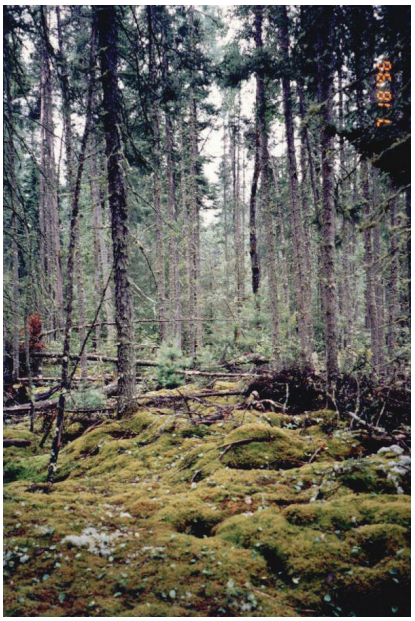
The Jack Pine-Aspen Forest Mosaic (JPAX) map unit represents this association. This map unit also represents tight mosaic forest stands of Jack Pine / Balsam Fir Forest association (A40) and Aspen - Birch / Boreal Conifer Forest association (A46) and/or Aspen - Birch - Red Maple Forest association (A47).

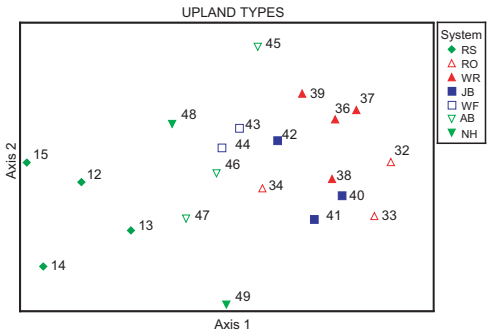
MINNESOTA STATE TYPE 2003

Black Spruce - Jack Pine Woodland, Jack Pine - Balsam Fir Subtype (FDn32c2)

A42 Black Spruce / Feathermoss Forest

Picea mariana / Pleurozium schreberi Forest





Description

In this community, canopy cover of black spruce ranges from 40 to 100%. Jack pine, paper birch, and trembling aspen can also occur in the canopy at low to moderate cover. The subcanopy is nonexistent or consists of a low cover of balsam fir. The shrub layer is moderately abundant, with black spruce and balsam fir most common. In stands with a more open canopy, the field layer can contain dwarf-shrubs, especially *Vaccinium angustifolium* (lowbush blueberry), but herbs are especially abundant, including *Aster macrophyllus* (large-leaved aster), *Cornus canadensis* (bunchberry), *Linnaea borealis* (twinflower), and *Maianthemum canadense* (Canada mayflower). In dense black spruce stands, the herb layer can be as low as 5%. Feathermoss, mainly *Pleurozium schreberi*, *Ptilium crista-castrensis,* and *Hylocomnium splendens,* usually covers 80–100% of the forest floor, though in some closed canopy situations may be virtually absent.

Stands occur on flat to very steep (35% slope) terrain often with a northerly aspect. They can also occur on ridge tops where shallow soils have developed down slope from open bedrock. The terrain is usually very rocky, the rocks often covered by feathermoss. Patches of exposed bedrock are common. The soils are shallow sandy or silt loams averaging 2–10 cm deep over bedrock or loose rock. Fires may occur within 50–100-year periods.

CHARACTERISTIC SPECIES (n = 11, 28)

Tree

*Abies balsamea (*balsam fir) IV.7, *Betula papyrifera* (paper birch) IV.7, *Picea mariana* (black spruce) V.45, *Pinus banksiana* (jack pine) III.15

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.4, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) V.7, *Corylus cornuta* (beaked hazelnut) IV.7, *Picea mariana* (black spruce) V.25, *Pinus strobus* (white pine) V.2, *Populus tremuloides* (trembling aspen) IV.7

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.2, *Gaultheria procumbens* (wintergreen) IV.2, *Lonicera canadensis* (fly honeysuckle) IV.1, *Vaccinium angustifolium* (lowbush blueberry) V.7

Forb

Aralia nudicaulis (wild sarsaparilla) V.2, *Aster macrophyllus* (large-leaved aster) IV.4, *Clintonia borealis* (bluebead lily) IV.1, *Cornus canadensis* (bunchberry) V.15, *Linnaea borealis* (twinflower) V.4, *Lycopodium clavatum* (running clubmoss) IV.2, *Lycopodium obscurum* (and others) (princess-pine) V.2, *Maianthemum canadense* (Canada mayflower) V.4, *Trientalis borealis* (starflower) V.2

RANGE

Voyageurs National Park

This type is relatively restricted in the Park, commonly occurring on moist, north-facing slopes. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Jack Pine - Black Spruce Forest System.

Global

This community is found in the most northerly parts of the Great Lakes region of the United States and is common in the boreal regions of central Canada.

COMMENTS

Diagnostic features of the type include strong dominance by black spruce with a feathermoss carpet of *Pleurozium schreberi, Ptilium crista-castrensis,* and *Hylocomnium splendens*. Mixed black spruce-aspen stands would also be placed in this type, though if white spruce and balsam are also present, stands may better fit Spruce - Fir - Aspen Forest (A44). Sphagnum is generally absent, but may be present on lower slopes adjacent to swamps, where this community can occur mixed with the Black Spruce / Labrador Tea Poor Swamp (A4). The A42 type is similar to Ontario's V33, and part of V34 (Sims and others, 1997).

MAP UNITS

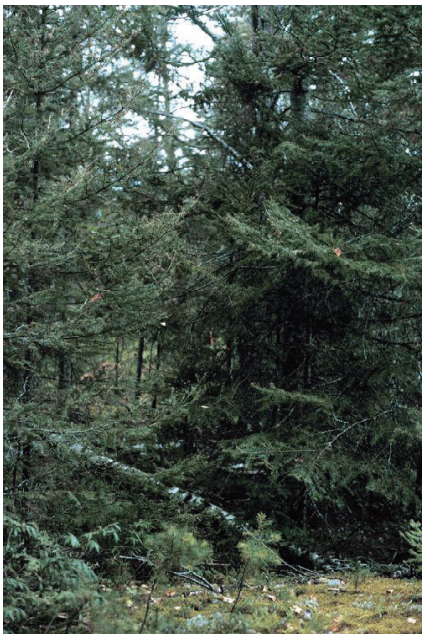
The Black Spruce/Feathermoss Forest (BSF) map unit represents this association.

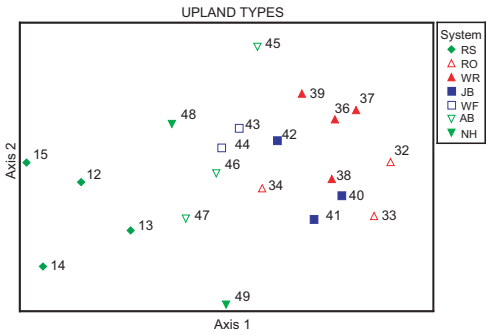
MINNESOTA STATE TYPE 2003

Black Spruce - Jack Pine Woodland, Black Spruce - Feathermoss Subtype (FDn32c2)

A43 Spruce - Fir / Mountain Maple Forest

Picea glauca - Abies balsamea / Acer spicatum / Rubus pubescens Forest





Description

The canopy of this community is typically fairly open (40–70%) and composed predominantly of white spruce and balsam fir, with occasional black spruce. Deciduous trees, especially paper birch and trembling aspen, may be present in the canopy with <25% relative cover. A shrub layer, though variable in cover, contains balsam fir, *Corylus cornuta* (beaked hazelnut), *Acer spicatum* (mountain maple), paper birch, and/or trembling aspen. Dwarf-shrubs are not common, though *Vaccinium angustifolium* (lowbush blueberry) is often present. Herbs are variable in their cover, ranging from 10 to 80%; the most abundant species are *Aster macrophyllus* (large-leaved aster), *Linnaea borealis* (twinflower), *Pteridium aquilinum* (bracken fern), *Aralia nudicaulis* (wild sarsaparilla), *Cornus canadensis* (bunchberry), and *Rubus pubescens* (dwarf raspberry). A moss layer of *Pleurozium schreberi* may be absent or present up to 40% cover.

This type most commonly occurs on gentle to moderate slopes above beaver ponds and lakeshores. Aspects are variable. Coarse woody debris is often abundant. Soils are generally rocky, 3–15 cm deep sandy loams. These sites are well to moderately well drained.

CONSERVATION RANK G4G5 **DATABASE CODE** CEGL002446

CHARACTERISTIC SPECIES (n = 3, 21)

Tree

*Abies balsamea (*balsam fir) IV.15, *Picea glauca* (white spruce) V.25

Shrub

Abies balsamea (balsam fir) V.35, *Acer rubrum* (red maple) V.15, *Acer spicatum* (mountain maple) IV.7, *Alnus viridis* (green alder) IV.7, *Amelanchier* spp. (serviceberry) V.4, *Betula papyrifera* (paper birch) IV.15, *Corylus cornuta* (beaked hazelnut) V.35, *Picea glauca* (white spruce) V.4, *Populus tremuloides* (trembling aspen) IV.15

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) V.2, *Lonicera canadensis* (fly honeysuckle) V.2, *Rubus strigosus* (red raspberry) V.15, *Vaccinium angustifolium* (lowbush blueberry) V.2

Forb

Aralia nudicaulis (wild sarsaparilla) V.4, *Aster macrophyllus* (large-leaved aster) V.25, *Clintonia borealis* (bluebead lily) V.2, *Cornus canadensis* (bunchberry) V.15, *Fragaria vesca* (wood strawberry) V.2, *Galium triflorum* (three-flowered bedstraw) V.2, *Linnaea borealis* (twinflower) IV.7, *Lycopodium clavatum* (running clubmoss) V.2, *L. obscurum* (and others) (princess-pine) V.2, *Maianthemum canadense* (Canada mayflower) V.2, *Pteridium aquilinum* (bracken fern) V.15, *Rubus pubescens* (dwarf raspberry) V.7, *Trientalis borealis* (starflower) V.2

Graminoid

Oryzopsis asperifolia (mountain rice-grass) V.4

RANGE

Voyageurs National Park

This type most commonly occurs on gentle to moderate slopes above wetlands and lakeshores throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, White Spruce - Fir Forest System.

Global

This community is found in the northern Great Lakes region of the United States and parts of central Canada.

COMMENTS

Diagnostic features of the type include the evergreen canopy of white spruce and balsam fir—with occasional black spruce, <25% cover of deciduous trees, and mesic species indicators. As deciduous trees, such as paper birch and trembling aspen increase to >25% cover, this type grades into the Spruce - Fir - Aspen Forest (A44). In stands where beaver and spruce budworm have taken most of the trees, this type can be converted to the Boreal Hazelnut - Serviceberry Rocky Shrubland (A35). As a shrubland type, however, that type must have <25% cover of trees. The A43 type is similar to Ontario's V24 (Sims and others, 1997).

Stands of this type are often located above beaver ponds and adjacent to lakes and, therefore, subject to beaver feeding. In many circumstances, the open canopy of these stands is the result of beavers removing the deciduous trees in what may have been, for example, a Spruce - Fir - Aspen Forest (A44). Balsam fir can also be defoliated and killed by spruce budworm.

MAP UNITS

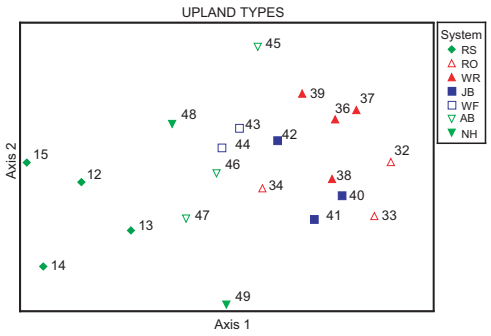
The Spruce-Fir/Mountain Maple Forest (SF) map unit represents this association.

MINNESOTA STATE TYPE 2003

Aspen - Birch Forest Balsam Fir Subtype (FDn43b1)

A44 Spruce - Fir - Aspen Forest

Picea glauca - Abies balsamea - Populus tremuloides / Mixed Herbs Forest



Description

The canopy in this type is dominated by a coniferous-hardwood mix of trembling aspen, paper birch, white spruce, and balsam fir and is usually closed (70–90% cover). The subcanopy is usually absent, but if present consists of a low (20%) cover of balsam fir or red maple. This community characteristically contains large gaps in the canopy allowing for a prominent shrub layer. Typically shrubs include balsam fir, trembling aspen, paper birch, red maple, and *Corylus cornuta* (beaked hazelnut). In the field layer, the dwarf-shrub *Vaccinium angustifolium* (lowbush blueberry) is sometimes common. There is generally a fairly low species diversity in the herb layer and cover is typically from 70 to 80% but can be as low as 30%. Common species include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Clintonia borealis* (bluebead lily), *Cornus canadensis* (bunchberry), *Lycopodium obscurum* (and others) (princess-pine), and *Rubus pubescens* (dwarf raspberry).

This community almost always occurs on gentle slopes (0–10%) with variable aspects. Bedrock and coarse surficial rocks are common. Soils are usually rocky, shallow sandy loams or silt loams.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002475

CHARACTERISTIC SPECIES (n = 8, 44)

Tree

Abies balsamea (balsam fir) IV.7, *Acer rubrum* (red maple) IV.7, *Betula papyrifera* (paper birch) V.15, *Populus tremuloides* (trembling aspen) IV.25

Shrub

Abies balsamea (balsam fir) V.35, *Acer rubrum* (red maple) V.25, *A. spicatum* (mountain maple) IV.4, *Amelanchier* spp. (serviceberry) V.2, *Betula papyrifera* (paper birch) V.15, *Corylus cornuta* (beaked hazelnut) V.7, *Picea glauca* (white spruce) V.4, *Pinus strobus* (white pine) IV.1, *Populus tremuloides* (trembling aspen) IV.15

Dwarf-shrub

Lonicera canadensis (fly honeysuckle) V.2, *Rubus strigosus* (red raspberry) III.4, *Vaccinium angustifolium* (lowbush blueberry) V.4

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) V.15, *Clintonia borealis* (bluebead lily) V.4, *Cornus canadensis* (bunchberry) V.7, *Dryopteris carthusiana* (and others) (spinulose fern) IV.1, *Fragaria virginiana* (common strawberry) IV.4, *Galium triflorum* (three-flowered bedstraw) V.2, *Linnaea borealis* (twinflower) IV.1, *Lycopodium annotinum* (bristly clubmoss) III.4, *L. clavatum* (running clubmoss) V.2, *L. obscurum* (and others) (princess-pine) V.7, *Maianthemum canadense* (Canada mayflower) V.2, *Pteridium aquilinum* (bracken fern) V.2, *Rubus pubescens* (dwarf raspberry) V.15, *Streptopus roseus* (rosey twisted-stalk) V.2, *Trientalis borealis* (starflower) V.2

RANGE

Voyageurs National Park

This type is common throughout the Park on moderately moist, low-lying sites. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, White Spruce - Fir Forest System.

Global

This community is found in the northern Great Lakes region of the United States and parts of central Canada.

COMMENTS

Diagnostic features of the type include a coniferous-hardwood mix of trembling aspen, paper birch, white spruce, and balsam fir, closed canopy and mesic indicator species. When the deciduous canopy cover is <25%, this type can grade into the Aspen - Birch - Boreal Conifer Forest (A46). Rarely, some stands may be dominated by black spruce and aspen, and those stands may resemble a Black Spruce - Aspen Forest phase (CT2), which is included in this type. In stands that border beaver ponds, selective beaver cutting of aspen and birch trees may cause these types to shift to Spruce - Fir / Mountain Maple Forest (A43) or Boreal Hazelnut - Serviceberry Rocky Shrubland (A35). The A44 type is similar to Ontario's V15 and V14 (Sims and others, 1997).

Many of the balsam fir trees and saplings in this type can be injured or killed by spruce budworm infestations.

MAP UNITS

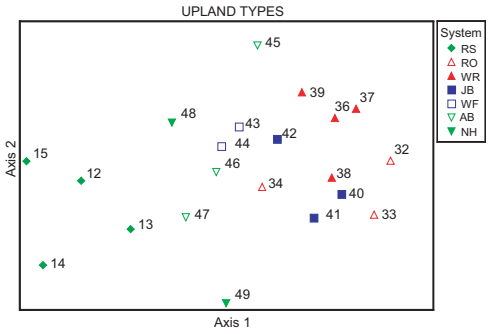
The Spruce-Fir-Aspen Forest (SFA) map unit represents this association.

MINNESOTA STATE TYPE 2003

Aspen - Birch Forest Balsam Fir Subtype (FDn43b1)

A45 Paper Birch / Fir Forest

Betula papyrifera / Diervilla lonicera - (Abies balsamea) Forest



Description

The canopy is dominated by paper birch, frequently being the only tree species in the canopy. Trembling aspen and balsam fir are common associates. The canopy is moderately open (60–80% cover) and usually composed of trees 10–15 m tall. *Corylus cornuta* (beaked hazelnut) is the dominant shrub, along with balsam fir. The herb layer is typically 70–90% cover and is often dominated by *Aster macrophyllus* (large-leaved aster), *Lycopodium obscurum* (and others) (princess-pine), *Pteridium aquilinum* (bracken fern), and *Aralia nudicaulis* (wild sarsaparilla).

This type usually occurs on flat terrain or gentle slopes with variable aspects. Soils of this community are shallow sandy loams usually 3–10 cm deep over bedrock.

CONSERVATION RANK G4?

DATABASE CODE CEGL002463

CHARACTERISTIC SPECIES (n = 1, 5)

Tree

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.15, *Betula papyrifera* (paper birch) V.85

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.4, *Betula papyrifera* (paper birch) V.4, *Corylus cornuta* (beaked hazelnut) V.35, *Quercus rubra* (red oak) V.4

Forb

Aster macrophyllus (large-leaved aster) V.15, *Lycopodium obscurum* (and others) (princess-pine) V.15

RANGE

Voyageurs National Park

Large stands of this type are known from only one location in Voyageurs National Park - Deer Island. Smaller, isolated patches of this forest, however, can be found scattered throughout the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Aspen - Birch Forest System.

Global

This community is found in the northern Great Lakes region of the United States and parts of central Canada.

COMMENTS

Diagnostic feature of the type is a canopy comprised almost entirely of paper birch (typically >90%), with *Corylus cornuta* (beaked hazelnut) and balsam fir in the shrub layer. This type has a tree layer similar to the Aspen - Birch / Boreal Conifer Forest (A46), but that type has much stronger dominance of aspen, and this type has groundlayer species of drier habitats. This type may originate on drier sites after fire. The A45 type is similar to Ontario's V4 (Sims and others, 1997).

MAP UNITS

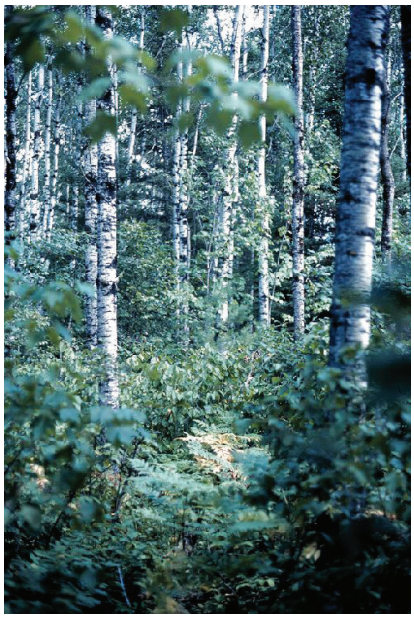
The Paper Birch/Fir Forest (PB) map unit represents this association.

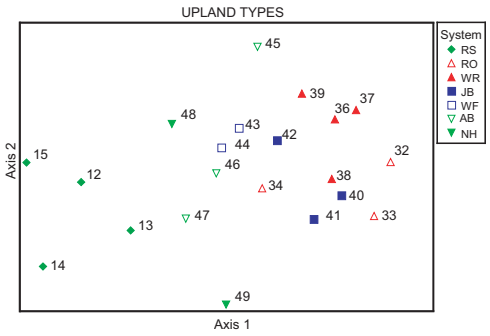
MINNESOTA STATE TYPE 2003

Aspen - Birch Forest Balsam Fir Subtype (FDn43b1)

A46 Aspen - Birch / Boreal Conifer Forest

Populus tremuloides - Betula papyrifera / (Abies balsamea, Picea glauca) Forest





Description

This is one of the most variable types in the Park and environs. It includes fairly young forests, where the canopy is 5–10 m tall, to the more mature stands, where the canopy is 20–35 m tall. Typically, the canopy is dominated by trembling aspen, paper birch, and/or bigtooth aspen. The subcanopy, where present, contains low cover (20–30%) of balsam fir and red maple. The shrub layer, often with 30–40% cover, contains balsam fir, red maple, *Acer spicatum* (mountain maple), and *Corylus cornuta* (beaked hazelnut). The herb layer is usually 70–90% cover and includes *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Clintonia borealis* (bluebead lily), *Cornus canadensis* (bunchberry), *Maianthemum canadense* (Canada mayflower), *Mitella nuda* (naked miterwort), *Pteridium aquilinum* (bracken fern), and *Rubus pubescens* (dwarf raspberry).

This type occurs in a wide variety of positions on the landscape from well drained ridges with shallow soils to moderately drained lower areas. Though they can occupy moderate (6–14 degree) slopes, they generally occur on flat to gently sloping terrain with variable aspects. Soils are very rocky loams or fine sandy loams ranging from 2 to 10 cm deep. The more mesic example of this type may occur over a clay subsoil. An abundance of coarse woody debris is common.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002466

CHARACTERISTIC SPECIES (n = 4, 73)

Tree

Abies balsamea (balsam fir) V.15, *Betula papyrifera* (paper birch) IV.15, *Picea glauca* (white spruce) III.4, *Populus tremuloides* (trembling aspen) V.55

Shrub

Abies balsamea (balsam fir) V.15, *Acer rubrum* (red maple) V.15, *A. spicatum* (mountain maple) V.35, *Amelanchier* spp. (serviceberry) V.2, *Betula papyrifera* (paper birch) V.15, *Cornus rugosa* (round-leaved dogwood) V.2, *Corylus cornuta* (beaked hazelnut) V.25, *Fraxinus nigra* (black ash) IV.4, *Picea glauca* (white spruce) IV.7, *Populus tremuloides* (trembling aspen) V.15, *Viburnum rafinesquianum* (downy arrow-wood) V.2

Dwarf-shrub

Diervilla lonicera (bush honeysuckle) IV.1, *Lonicera canadensis* (fly honeysuckle) V.7, *Rubus strigosus* (red raspberry) IV.15

Forb

Actaea rubra (red baneberry) IV.1, *Anemone quinquefolia* (wood-anemone) V.2, *Aralia nudicaulis* (wild sarsaparilla) V.25, *Aster macrophyllus* (large-leaved aster) V.55, *Clintonia borealis* (bluebead lily) V.4, *Cornus canadensis* (bunchberry) V.15, *Equisetum sylvaticum* (wood horsetail) IV.1, *Fragaria virginiana* (common strawberry) IV.1, *Galium triflorum* (three-flowered bedstraw) V.4, *Maianthemum canadense* (Canada mayflower) V.7, *Mitella nuda* (naked miterwort) IV.7, *Petasites frigidus* (palmate sweet coltsfoot) V.2, *Pteridium aquilinum* (bracken fern) IV.15, *Rubus pubescens* (dwarf raspberry) V.15, *Streptopus roseus* (rosey twisted-stalk) V.4, *Trientalis borealis* (starflower) V.2

RANGE

Voyageurs National Park

This is one of the most abundant and widespread types in the Park and environs. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Aspen - Birch Forest System.

Global

This community is found in the Great Lakes region of the United States and widely throughout central Canada.

COMMENTS

Diagnostic features of the type include the canopy of trembling aspen, paper birch, and/or bigtooth aspen, low cover of conifers, a shrub layer or subcanopy layer of balsam fir, red maple, *Acer spicatum* (mountain maple) and *Corylus cornuta* (beaked hazelnut). Both dry and mesic versions of this type are common in the Park. This type can resemble the Spruce - Fir - Aspen Forest (A44), but has <25% spruce or fir in the canopy. The richer versions of this type, which generally occur on deeper soils, can grade into the Trembling Aspen - Balsam Poplar Lowland Forest (A13). This occurs commonly in areas where there is less topographic relief and lacustrine clay is more common in the subsoil. Where bedrock outcrops occur and canopy is <60% cover, this type can grade into the Mixed Aspen Rocky Woodland (A34). The Aspen - Birch - Red Maple Forest (A47) is very similar to this type, but contains more northern hardwood forest species, with little or no balsam fir in the subcanopy and shrub layers. That type, however, is very rare in the Park. Where both red maple and balsam fir occur mixed in the subcanopy and shrub layers, the stand is considered the Aspen - Birch / Boreal Conifer Forest. The A46 type is similar to Ontario's V6–V9 (Sims and others, 1997). It was not mapped separately from A47 because the overstory was too similar, and A47 was very uncommon in the Park.

(Continued on page 124)

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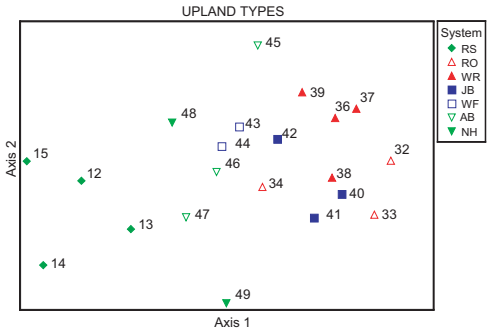
A47 Aspen - Birch - Red Maple Forest

Populus tremuloides - Betula papyrifera - (Acer rubrum, Populus grandidentata) Forest



Description

This deciduous forest community has a moderately closed canopy usually dominated by trembling aspen, paper birch, red maple, and occasionally green ash and black ash. In the shrub layer, common species include red maple, *Acer spicatum* (mountain maple), *Amelanchier* spp. (serviceberry), *Cornus stolonifera* (red-osier dogwood), and *Corylus cornuta* (beaked hazelnut). The herb layer tends to contain many species. Common species include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Cornus canadensis* (bunchberry), *Fragaria virginiana* (common strawberry), *Galium triflorum* (three-flowered bedstraw), *Maianthemum canadense* (Canada mayflower), and *Rubus pubescens* (dwarf raspberry).

Stands occur on level to rolling topography. It can occur on upper slopes or plateaus or in valley bottoms. The soil is typically deep, sandy loam or loamy sand. The sites are on glacial outwash, lacustrine deposits. Sites range from well drained to somewhat poorly drained.

CONSERVATION RANK G5 **DATABASE CODE** CEGL002467

CHARACTERISTIC SPECIES (n = 4, 4)

Tree

Betula papyrifera (paper birch) V.7, *Fraxinus pennsylvanica* (green ash) III.4, *Populus tremuloides* (trembling aspen) V.45

Shrub

Abies balsamea (balsam fir) IV.2, *Acer rubrum* (red maple) V.7, *A. spicatum* (mountain maple) IV.25, *Amelanchier* spp. (serviceberry) V.7, *Betula papyrifera* (paper birch) V.7, *Cornus rugosa* (round-leaved dogwood) IV.1, *C. stolonifera* (red-osier dogwood) IV.7, *Corylus cornuta* (beaked hazelnut) V.15, *Fraxinus nigra* (black ash) IV.25, *F. pennsylvanica* (green ash) IV.15, *Populus tremuloides* (trembling aspen) V.35, *Viburnum rafinesquianum* (downy arrow-wood) IV.2

Dwarf-shrub

Lonicera canadensis (fly honeysuckle) IV.2, *Prunus virginiana* (chokecherry) IV.2, *Rubus strigosus* (red raspberry) IV.1

Forb

Actaea rubra (red baneberry) IV.1, *Apocynum androsaemifolium* (spreading dogbane) V.1, *Aralia nudicaulis* (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) V.15, *Botrychium virginianum* (rattlesnake fern) V.2, *Clintonia borealis* (bluebead lily) IV.1, *Cornus canadensis* (bunchberry) V.4, *Dryopteris carthusiana* (and others) (spinulose fern) IV.1, *Equisetum sylvaticum* (wood horsetail) IV.1, *Fragaria virginiana* (common strawberry) V.4, *Galium triflorum* (three-flowered bedstraw) V.4, *Maianthemum canadense* (Canada mayflower) V.4, *Mitella nuda* (naked miterwort) IV.2, *Petasites frigidus* (palmate sweet coltsfoot) IV.1, *Pteridium aquilinum* (bracken fern) III.4, *Rubus pubescens* (dwarf raspberry) V.7, *Streptopus roseus* (rosey twisted-stalk) IV.1, *Trientalis borealis (starflower)* V.2

RANGE

Voyageurs National Park

Based on field observations, this type is localized in the Park. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Aspen - Birch Forest System.

Global

This community is found in the central and northern Great Lakes region and parts of the northeastern United States, extending into adjacent parts of Canada.

COMMENTS

This community contains trembling aspen and red maple, along with other hardwoods species, and balsam fir is very uncommon. It tends to occupy somewhat wetter sites than the Aspen - Birch / Boreal Conifer Forest (A46), and can grade into the Trembling Aspen - Balsam Poplar Lowland Forest (A13). The A47 type is similar to Ontario's V3.1 (Sims and others, 1997). It was not mapped separately from A46 because the overstory was too similar, and this type was very uncommon in the Park.

MAP UNITS

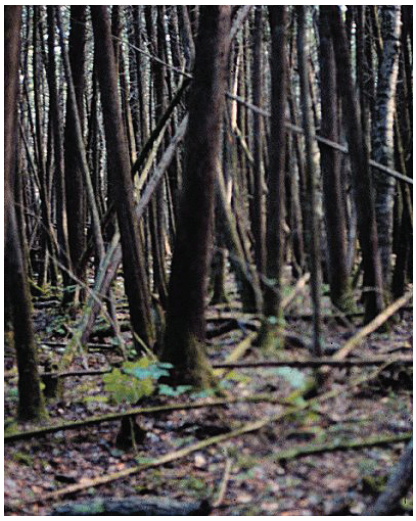
The Quaking Aspen-Paper Birch Forest (AB) map unit represents this association and the Aspen - Birch / Boreal Conifer Forest association (A46). This association is also mapped with the Jack Pine-Aspen Forest Mosaic (JPAX) map unit and the White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit when aspen stands are in tight mosaic pattern with pine stands.

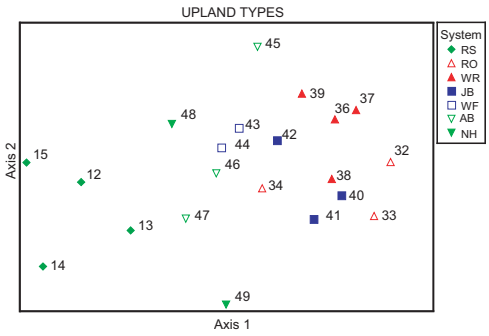
MINNESOTA STATE TYPE 2003

Aspen - Birch Forest Hardwood Subtype (FDn43b2)

A48 White Cedar - Yellow Birch Forest

Thuja occidentalis - Betula alleghaniensis Forest





Description

This community is dominated by a canopy of white-cedar, with lesser amounts of trembling aspen (yellow birch is rare in the Park), balsam fir, and bigtooth aspen. The shrub and herb layers vary with tree canopy closure, more dense as tree canopy opens up. Shrubs include white-cedar, balsam fir, red maple, and *Acer spicatum* (mountain maple). Herbs include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Clintonia borealis* (bluebead lily), *Linnaea borealis* (twinflower), *Lycopodium annotinum* (bristly clubmoss), and *Lycopodium clavatum* (running clubmoss). The most abundant moss species is *Rhytidiadelphus triquetrus*.

Stands occur on flat or gently sloping terrain with variable aspects. They frequently occupy toeslopes located just above wetland communities. There is often very little surficial bedrock. Soils contain a shallow (1–5 cm) organic layer over 5–15 cm of loam or silt loam over dense lacustrine clay. In some cases, a shallow buildup of well decomposed peat may be present. Microtopography is typically flat.

CONSERVATION RANK G2Q **DATABASE CODE** CEGL002450

CHARACTERISTIC SPECIES (n = 4, 21)

Tree

*Abies balsamea (*balsam fir) IV.15, *Betula papyrifera* (paper birch) IV.15, *Picea glauca* (white spruce) IV.15, *Thuja occidentalis* (white-cedar) IV.25

Shrub

Abies balsamea (balsam fir) V.25, *Acer rubrum* (red maple) V.7, *A. spicatum* (mountain maple) III.15, *Amelanchier* spp. (serviceberry) IV.1, *Betula papyrifera* (paper birch) V.7, *Corylus cornuta* (beaked hazelnut) IV.1, *Picea glauca* (white spruce) IV.1, *Pinus strobus* (white pine) IV.1, *Populus tremuloides* (trembling aspen) IV.2, *Thuja occidentalis* (white-cedar) IV.35

Dwarf-shrub

Lonicera canadensis (fly honeysuckle) V.4, *Vaccinium angustifolium* (lowbush blueberry) V.2

Forb

Aralia nudicaulis (wild sarsaparilla) V.7, *Aster macrophyllus* (large-leaved aster) IV.7, *Clintonia borealis* (bluebead lily) V.4, *Cornus canadensis* (bunchberry) V.2, *Galium triflorum* (three-flowered bedstraw) IV.1, *Linnaea borealis* (twinflower) V.4, *Lycopodium annotinum* (bristly clubmoss) IV.7, *Lycopodium clavatum* (running clubmoss) IV.7, *Lycopodium obscurum* (and others) (princess-pine) IV.1, *Maianthemum canadense* (Canada mayflower) IV.2, *Mitella nuda* (naked miterwort) IV.1, *Streptopus roseus* (rosey twisted-stalk) IV.1, *Trientalis borealis* (starflower) V.4

Graminoid

Carex gracillima (graceful sedge) III.4, *Oryzopsis asperifolia (mountain rice-grass)* IV.1

RANGE

Voyageurs National Park

This type is most commonly found in the environs south and southwest of the Park, but also occurs less commonly in the southern part of the Park on flat terrain. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Hardwoods - (Conifer) Forest System.

Global

This community is found in the northern Great Lakes region of the United States and adjacent regions in Canada.

COMMENTS

Diagnostic features of the type include dominance by white-cedar, with trembling aspen and paper birch as co-associates, with a rich diversity of moist indicator species, but few wetland species. Yellow birch is more common in examples outside the Park. Stands are closely related to the White Cedar - Boreal Conifer Mesic Forest (A12). Though uncommon, some stands that are more well drained may be more closely related to the mesic versions of the Spruce - Fir / Mountain Maple Forest (A43). The A48 type is most similar to Ontario's V21 (Sims and others, 1997).

The predominance of trembling aspen in the canopy and emergent layers of this community may reflect a disturbed (post-logging) phase of the White Cedar - Yellow Birch Forest.

MAP UNITS

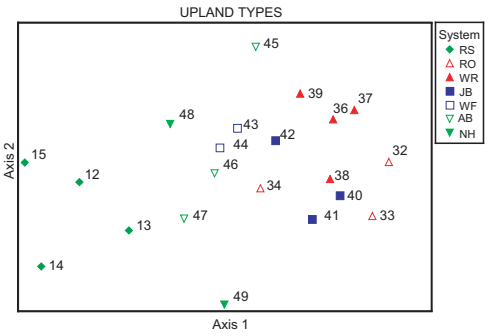
The White Cedar-Yellow Birch Forest (WCA) map unit represents this association.

MINNESOTA STATE TYPE 2003

Upland White Cedar Forest (FDn43c)

A49 Northern Bur Oak Mesic Forest

Quercus macrocarpa / (Amelanchier alnifolia, Cornus drummondii) / Aralia nudicaulis Forest



Description

The canopy of this forest community is typically dominated by bur oak, with green ash or basswood as common co-dominants. Trembling aspen, paper birch, and red maple may be present in the canopy at low cover. A shrub layer of 20–80% cover is almost always present and may consist of the following species: red maple, *Amelanchier* spp. (serviceberry), *Cornus drummondii (= rugosa)* (round-leaved dogwood), *Corylus cornuta* (beaked hazelnut), *Ostrya virginiana* (ironwood), *Quercus macrocarpa* (bur oak), *Tilia americana* (basswood), *Ulmus americana* (American elm), and *Viburnum rafinesquianum* (downy arrow-wood). The herb layer is usually well developed and comprises 80–90% cover. Common species include *Aralia nudicaulis* (wild sarsaparilla), *Aster macrophyllus* (large-leaved aster), *Circaea lutetiana* (Canada enchanter's nightshade), and *Osmorhiza claytonii* (Clayton's sweet cicely).

Stands occur on level to gently sloping terrain with variable aspects. They are most common on dry-mesic to mesic sites on islands or peninsulas. Soils are loams or sandy loams and can be shallow (3–7 cm) or relatively deep (20–35+ cm). In stands with shallower soils, patches of exposed bedrock may exist.

CONSERVATION RANK **DATABASE CODE** CEGL002072

CHARACTERISTIC SPECIES (n = 4, 29)

Tree

Acer rubrum (red maple) III.4, *Betula papyrifera* (paper birch) III.4, *Fraxinus pennsylvanica* (green ash) III.15, *Quercus macrocarpa* (bur oak) V.25, *Tilia americana* (basswood) V.35

Shrub

Abies balsamea (balsam fir) III.4, *Acer rubrum* (red maple) V.7, *A. spicatum* (mountain maple) III.4, *Amelanchier* spp. (serviceberry) V.25, *Cornus rugosa* (round-leaved dogwood) IV.25, *Corylus cornuta* (beaked hazelnut) V.15, *Fraxinus nigra* (black ash) III.15, *F. pennsylvanica* (green ash) III.7, *Ostrya virginiana* (ironwood) IV.25, *Populus grandidentata* (big-tooth aspen) III.4, *Quercus macrocarpa* (bur oak) V.7, *Tilia americana* (basswood) V.25, *Ulmus americana* (American elm) IV.15, *Viburnum lentago* (nannyberry) III.7, *V. rafinesquianum* (downy arrow-wood) IV.25

Dwarf-shrub

Lonicera canadensis (fly honeysuckle) IV.1, *Parthenocissus* (virginia creeper; woodbine) IV.1, *Prunus virginiana* (chokecherry) IV.1, *Rhus radicans* (poison ivy) III.7, *Rubus strigosus* (red raspberry) IV.7, *Symphoricarpos occidentalis* (and others) (wolfberry) IV.2

Forb

Actaea rubra (red baneberry) IV.1, *Aralia nudicaulis* (wild sarsaparilla) IV.7, *Aster macrophyllus* (large-leaved aster) V.15, *Circaea lutetiana* (Canada enchanter's nightshade) III.15, *Fragaria virginiana* (common strawberry) V.2, *Galium triflorum* (three-flowered bedstraw) IV.1, *Lathyrus ochroleucus* (pale vetchling) IV.1, *Maianthemum canadense* (Canada mayflower) V.4, *Osmorhiza claytonii* (clayton's sweet cicely) III.15, *Rubus pubescens* (dwarf raspberry) IV.1, *Trientalis borealis* (starflower) IV.1, *Uvularia grandiflora* (yellow bellwort) IV.2

Graminoid

Oryzopsis asperifolia (mountain rice-grass) III.7

RANGE

Voyageurs National Park

This type is most common on islands or peninsulas on Lake Kabetogama. For distribution of how this plant community was mapped, refer to the location map in Appendix 5 entitled Plant Community Types, Northern Hardwoods - (Conifer) Forest System.

Global

This community occurs in the the northern tallgrass prairie and woodland region of the United States.

COMMENTS

Diagnostic features of the type include the canopy of bur oak, with green ash or basswood as common co-dominants. Species more characteristic of the northern hardwoods rather than the boreal region are also more common, including *Cornus rugosa* (round-leaved dogwood), *Ostrya virginiana* (ironwood), and *Ulmus americana* (American elm). Stands of this type have diverse herb layers and may contain species that are found in few other communities in the Park, including *Uvularia grandiflora* (yellow bellwort), *U. sessiliflora* (pale bellwort), *Trillium* spp. (trillium), and *Smilax herbacea* (tendriled carrion-flower). Overall, these stands are very unique in the boreal-dominated landscape at Voyageurs, and the placement of these bur oak stands into this association is tentative. See also the Minnesota description for MHn46. The A49 type is similar to Ontario's V3.2 (Sims and others, 1997).

Evidence of logging and past human habitation are frequently present in these stands, especially those on islands in Lake Kabetogama.

(Continued on page 124)

Additional Community Types

The following community types were initially described as possibly being present at Voyageurs National Park, but are not treated in the mapping project as distinct associations.

CT1. Balsam Fir - Paper Birch Forest (*Abies balsamea - Betula papyrifera* / *Diervilla lonicera* Forest) (n = 0, 0).

This evergreen type was not described separately at Voyageurs National Park. See global description for the fir-birch type using Database Code CEGL002474. Stands are typically mapped as part of the Spruce - Fir / Mountain Maple Forest (A43, CEGL002446) or the Spruce - Fir - Aspen Forest (A44, CEGL002475).

CT2. Black Spruce - Aspen Forest (*Picea mariana - Populus tremuloides* / Mixed Herbs Forest) (n = 0, 5)

This type was not described separately at Voyageurs National Park. See global description for this type using Database Code CEGL002516. Stands were typically mapped as part of the Spruce - Fir - Aspen Forest (A44, CEGL002475).

CT3. Bog Birch - Leatherleaf Poor Fen (*Betula pumila* / *Chamaedaphne calyculata* / *Carex lasiocarpa* Shrubland).

This type was initially listed as possibly being present at Voyageurs National Park, but upon review was subsequently removed. It closely resembles the Tamarack Scrub Poor Fen (A5) and the Leatherleaf Poor Fen (A6). See global description for this type using Database Code CEGL002494.

(Continued from page 49 - Type A13)

MAP UNITS

The Trembling Aspen-Balsam Poplar Lowland Forest (AL) map unit represents this association.

MINNESOTA STATE TYPE 2003

Black Ash - Aspen - Balsam Poplar Swamp (Northeast) (WFn55a)

(Continued from page 57 - Type A17)

COMMENTS

Diagnostic features of the type are canopy of white-cedar with *Alnus incana* (speckled alder) shrubs and *Sphagnum* spp. moss. This is one of the most floristically diverse types in the Park. In wetter and more minerotrophic conditions, the white-cedar in the canopy is often mixed with black ash and can grade into the White Cedar - Black Ash Swamp (A15). That type, however, has at least 25% of both white-cedar and ash in the canopy or a canopy of black ash with a subcanopy of white-cedar. That type also tends to have much less *Sphagnum* spp. In cases where tamarack and or black spruce are present in the canopy or in the emergent layer, this type can grade into a map phase described as the White Cedar-Tamarack Peat Swamp (WCT). At Voyageurs, the phase was not recognized as a separate association because it is very similar to stands without tamarack as a dominant. Globally that phase is still recognized as a distinct association (CEGL005225), based on patterns outside of Voyageurs. This type is similar to Ontario's W31 and W32 (Harris and others, 1996).

MAP UNITS

Two map units represent two structural phases of this one association: the White Cedar-(Mixed Conifer)/Alder Swamp (rich soil phase) (WCS) and the White Cedar-(Mixed Conifer)/Alder Swamp (peatland phase) (WCT).

MINNESOTA STATE TYPE 2003

White Cedar Swamp (NorthCentral) (FPn63b)

(Continued from page 59 - Type A18)

MAP UNITS

The Northern Tamarack Rich Swamp (TA) map unit represents this association.

MINNESOTA STATE TYPE 2003

Extremely Rich Tamarack Swamp (FPn82b)

(Continued from page 97 - Type A37)

MINNESOTA STATE TYPE 2003

Red Pine - White Pine Woodland (Canadian Shield) (FDn32a)

(Continued from page 103 - Type A40)

MAP UNITS

The Jack Pine/Balsam Fir Forest (JPF) represents this association. This association is also mapped with the Jack Pine-Aspen Forest Mosaic (JPAX) when jack pine stands are in tight mosaic pattern with aspen stands.

MINNESOTA STATE TYPE 2003

Black Spruce - Jack Pine Woodland, Jack Pine - Balsam Fir Subtype (FDn32c1)

(Continued from page 115 - Type A46)

MAP UNITS

The Quaking Aspen-Paper Birch Forest (AB) map unit represents this association and the Aspen - Birch - Red Maple Forest association (A47). This association is also mapped with the Jack Pine-Aspen Forest Mosaic (JPAX) map unit and the White Pine-Red Pine-Quaking Aspen-Birch Forest (WRPA) map unit when aspen stands are in tight mosaic pattern with pine stands.

MINNESOTA STATE TYPE 2003

Aspen - Birch Forest Balsam Fir Subtype (FDn43b1)

(Continued from page 121 - Type A49)

MAP UNITS

The Northern Bur Oak Mesic Forest (BO) map unit represents this association.

MINNESOTA STATE TYPE 2003

Aspen - Ash Forest (MHn46a)

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Appendix 1. Analytical Methods Used To Define Plant Community Types

Preliminary Classification List and Map Units

A preliminary list of vegetation types (associations and alliances) from Faber-Langendoen and others (1996; Midwest portion of U.S. National Vegetation Classification [USNVC]) was generated for the Park in May 1996 based on a variety of sources, including information from the Minnesota County Biological Survey and the Natural Heritage Program (1993), Sims and others (1989), and Harris and others (1996). The preliminary classification was field tested during summer and fall 1996 and 1997 by a team of aerial photointerpreters and ecologists who collected detailed vegetation plots and observation point data on the plant communities encountered in the field. The data helped clarify the nature of the classification units and their diagnostic aerial photo signatures.

Map units compatible with the vegetation types found within the project area were developed jointly between the photointerpretation and ecologist teams. Map units were made to match vegetation units on a one-to-one basis as often as possible. For several reasons, including complexity of the vegetation and lack of distinctive features between similar associations, some map units represent combinations of associations. In other instances, structural details within a single association could be mapped and were of potential interest to wildlife habitat models, so they were given their own map unit (see Appendix 4). Additional map units were derived from map land use and land cover features not described by the USNVC, such as populated areas, roads, agricultural lands, quarries, and large open water bodies that are <10% vegetated. To map these features, a land use and land cover classification system developed by Anderson and others (1976) was used (to Level II). A few more map units were developed to map park-specific situations such as small islands less than the minimum mapping unit of 0.5 ha, and small natural ponds (open water <10% vegetated). Additional information on the map unit process is described in Hop and others (2001). Maps of associations and ecological systems are provided in Appendix 5.

Vegetation Sampling and Analysis for Classification Development

Voyageurs National Park covers 88,244 ha, of which 54,336 ha is land and the remainder open water (lakes and ponds). The mapping project also included the environs around the Park, making the total area mapped about 156,886 ha. Most of the Park and environs fall in one ecological subsection (Border Lakes: 212La) as reported by the ECOMAP ecological

land classification (Keys and others, 1995). The Park was stratified into three areas: the western peatland area (Rat Root River Peatland), which falls mostly outside the Park boundaries but within the project area; the northern unit where the bedrock is primarily biotite schist (metasedimentary rocks) with local areas of greenstone; and a southern unit where the bedrock is primarily granite (the Vermillion granitic complex, Okajangas and Matsch, 1982). In 1996, the first year of reconnaissance and sampling, the first two areas were emphasized. In the second and third years (1997 and 1998), the third area was emphasized.

Plot sampling was generally limited to an average of three plots per type based on USGS-NPS Vegetation Mapping Program specifications, but less well-understood types were sampled more extensively. These plots were spread across the Park as much as possible. One hundred and ninety-one plots were collected for the project, and an additional 68 were added from surveys by Kurmis and others (1986) and the Minnesota Natural Heritage Program (MN NHP).

Plot sizes were 20 x 20 m for forests and woodlands and 10 x 10 m for shrublands, herbaceous, and nonvascular vegetation. Plots were selected to cover the distribution of types across the three stratified areas and placed subjectively in the most representative part of a selected stand. The vegetation was visually divided into strata and height and cover abundance of each stratum was estimated. Cover of dominant life forms was also estimated to match methods used by the MN NHP survey methods. All species found in each stratum were listed (including mosses and lichens) and percent cover was estimated for vascular plants using the Braun-Blanquet cover scale. Additional species within the vegetation unit or polygon occurring outside of sampled plots (generally within 2 m of the plot border) were listed separately. Species that were not identifiable in the field were collected for later identification. In addition to floristic information, the following environmental information was recorded on field forms: surficial geology, hydrologic (flooding) regime, soil drainage regime, soil texture, slope, aspect, topographic position, and evidence of disturbance. The X-Y coordinates of each plot were recorded in Universal Transverse Mercator (UTM) projection (Zone 15) using a Rockwell Precision Lightweight GPS Receiver (PLGR) and, on occasion, a Trimble GPS unit. Typical positional accuracy of GPS coordinates was approximately +/– 9.0 m. Other location information was also recorded. A provisional name for the vegetation type was assigned to the plot.

Vegetation plot data were entered into the MN NHP plot database. Species were assigned standardized codes and names based on Ownbey and Morley (1991). These data were transferred to the PLOTS database developed by The Nature Conservancy (1997), where species nomenclature and codes were

standardized to the PLANTS database (USDA, NRCS 1999). Plots were then uploaded to VegBank, a publicly viewable Vegetation Plots archive that will maintain the primary plot data for the U.S. National Vegetation Classification (USNVC) <www.vegbank.org>.

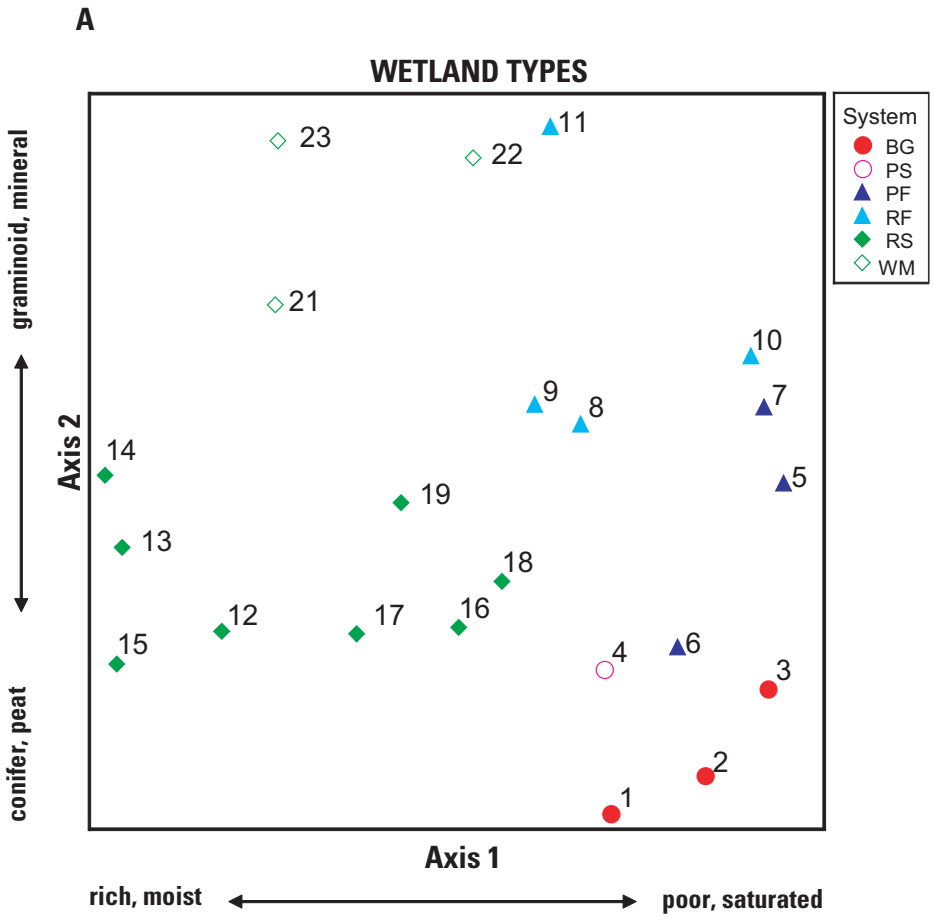
Vegetation data were analyzed using both ordination and cluster methods, including Non-metric Multidimensional Scaling (NMS), Detrended Correspondence Analysis (DCA) and Flexible Beta Cluster Analysis, as implemented in the PC-ORD software (McCune and Mefford, 1999). For the ordination methods, cover midpoint data were first relativized by species maxima, then transformed using arcsine-square root. This transformation places greater emphasis on the less abundant species in the data set. For NMS, analyses were run using a random starting configuration, with 15 runs of real data and 30 runs of randomized data (autopilot mode). Data were run using Sorenson Index. For the final upland and wetland datasets, iterations were 55, final stability was 0.00010. For DCA, the default settings were used (downweighting of rare species, segments = 26). For all data sets, species in <3% of the dataset were removed to reduce potential noise.

Given the complexity of the data sets, we sought to partition the plots into meaningful subsets. The overall ordinations of 259 plots were strongly skewed by the 26 marsh plots. After removal of the marsh plots, the subsequent analyses further suggested a distinction between primarily upland plots and primarily wetland plots. Outlier analysis based on ordination and cluster analysis suggested that a single rocky outcrop plot be removed, as well as three successional shrubby rock outcrop plots. Wet mineral forests occupied the center of the ordinations, and we chose to leave the 21 plots of these wet forests in both upland and wetland datasets. The upland dataset consisted of 138 plots x 219 species and the wetland dataset of 112 plots x 223 species. Assignment of plots to USNVC associations and Minnesota state types was made by visual inspection of the ordinations and cluster analyses, relying on NVC descriptions in Faber-Langendoen (2001) and state type descriptions in MN NHP (2003). This was done because of limitations of plot sampling size and restricted geographic area of sampling, compared to the availability of information for state and national classification units. The analyses also suggested several refinements to the USNVC associations, and these possible refinements are under review.

Plot patterns were then reviewed and assessed for perceived environmental gradients (e.g., moisture gradients, peat depth, and soil depth) for both wetland and upland stands.

Plots for each association were then summarized into a type summary (the fact sheets). Cover was averaged (based on midpoint of cover scales). All species present in ≥20% of the plots were retained (all species were

retained for plots with fewer than five plots per type [18 of 39 types]). We then re-submitted the types as "plots" in an ordination analysis — a common technique for summarizing vegetation patterns (Curtis, 1959; Harris and others, 1996; Sims and others, 1997). These type ordinations were run separately for uplands and wetlands. We used NMS, following the same approach as outlined above. The two ordinations shown in the fact sheets provide a key demonstration of the ability of the types themselves to summarize the vegetation and environmental relationship. These ordinations display the relative similarity among the types and locate the position of the types along major vegetation/environmental gradients. A summary of these environmental gradients for both the wetland and upland ordinations are shown in fig. 1.1.



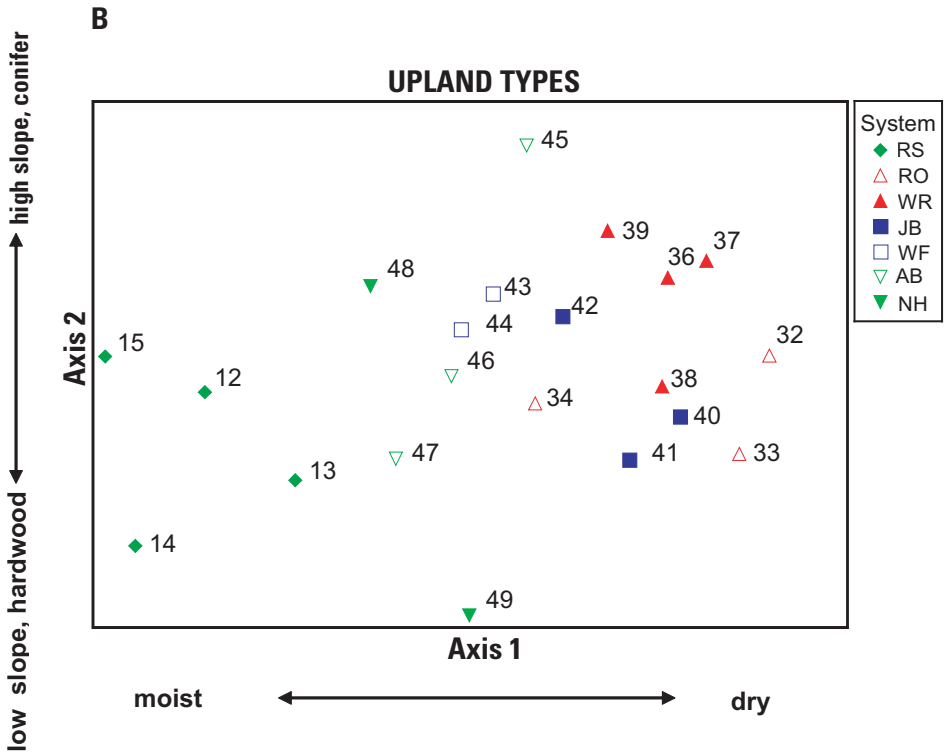


Figure 1.1. Summary ordinations for wetland (A) and upland (B) types. The ordinations are based on non-metric multi-dimensional scaling, and each point represents an association type, with the dot color-coded by System. The arrows and text on each axis provide a summary of the environmental gradients influencing the types. Types belonging to the Rich Swamp system are included in both the upland and wetland ordination, as they are wetlands with transitional characteristics to uplands. For a complete list of the codes and names of systems and associations, see Fact Sheets: List Of Plant Communities.

Appendix 2. Ecological Systems

Patterns among the plant communities (associations) can be portrayed using ecological systems; that is, groups of types that share similar ecological processes (Faber-Langendoen 2001; Comer and others, 2003). A more formal definition can be stated as follows: "Ecological Systems are dynamic assemblages or complexes of plant and/or animal communities that (1) occur together on the landscape; (2) are tied together by similar ecological processes, underlying abiotic environmental factors or gradients; and (3) form a readily identifiable unit on the ground." The use of ecological systems is a way of emphasizing some of the ecological, in addition to the floristic or physiognomic similarities among the types. The Systems presented here are ecosystems that were used to organize the plant communities at Voyageurs National Park and its environs; seven wetland systems and six upland systems (see <www.natureserve/explorer.org> for the most recent version). The criteria used to define them include hydrology, peat, acidity, vegetation structure and major dominants, and moisture. These groups help to highlight the ecological diversity found at and near Voyageurs National Park.

We used local, shorthand names for the system types, but their full name is shown in Table 2.1

Table 2.1. Local system name and standard System name used by NatureServe.

Number	Local System Name	Standard NatureServe System Code and Name
1	Bog	CES103.581 Boreal-Laurentian Bog
2	Poor Swamp	CES201.574 Laurentian-Acadian Acid Swamp
3	Poor Fen	CES201.583 Boreal-Laurentian-Acadian Acidic Basin Fen
4	Rich Fen	CES201.585 Laurentian-Acadian Alkaline Fen
5	Rich Swamp	CES201.575 Laurentian-Acadian Alkaline Swamp
6	Wet Meadow - Shrub Swamp	CES201.582 Laurentian-Acadian Wet Meadow-Shrub Swamp
7	Freshwater Marsh	CES201.594 Laurentian-Acadian Freshwater Marsh
8	Rocky Outcrop / Woodland	CES201.571 Laurentian-Acadian Acid Rocky Outcrop
9	Northern Pine - (Oak) Forest	CES201.719 Laurentian-Acadian Northern Pine-(Oak) Forest
10	Jack Pine - Black Spruce Forest	CES103.022 Boreal Jack Pine-Black Spruce Forest
11	White Spruce - Fir Forest	CES103.021 Boreal White Spruce-Fir-Hardwood Forest
12	Aspen - Birch Forest	CES103.020 Boreal Aspen-Birch Forest
13	Northern Hardwoods - (Conifer) Forest	CES201.564 Laurentian-Acadian Northern Hardwoods Forest

Appendix 3. Tree Names

Common and scientific names of tree species as used in the fact sheets.

Table 3.1. List of tree species used in the fact sheets.

Common name	Scientific name
Balsam fir	*Abies balsamea*
Basswood	*Tilia americana*
Big-tooth aspen	*Populus grandidentata*
Black ash	*Fraxinus nigra*
Black spruce	*Picea mariana*
Bur oak	*Quercus macrocarpa*
Green ash	*Fraxinus pennsylvanica*
Jack pine	*Pinus banksiana*
Northern pin oak	*Quercus ellipsoidalis*
Paper birch	*Betula papyrifera*
Red maple	*Acer rubrum*
Red pine	*Pinus resinosa*
Tamarack	*Larix laricina*
Trembling aspen	*Populus tremuloides*
White pine	*Pinus strobus*
White spruce	*Picea glauca*
White-cedar	*Thuja occidentalis*

Appendix 4. Relation Between Associations and Map Units For Voyageurs National Park Vegetation Mapping Project

Associations found in Voyageurs National Park, organized by ecological systems, are listed in Table 4.1. Associations are shown with the standard common names and abbreviated Community Element Global (CEGL) codes used in the U.S. National Vegetation Classification (e.g., full code would be CEGL002485). System names are local versions of formal ecological system types (Comer and others, 2003). The final column provides the map unit link to each association. The CEGL codes with an asterisk (*) indicate associations that were both uniquely mapped and are part of complexes. Codes with a double asterisk (**) indicate associations that were mapped only as part of a mosaic or complex. And, codes with a plus sign (+) indicate associations mapped at the alliance level. All other associations were mapped directly, sometimes with two or more map units (as phases) based on structural or floristic variability. Map unit codes designated with a superscript t (^{t}) are map units that have been adjusted from the original vegetation map (Hop and others, 2001) due to results of subsequent vegetation analysis from this project. Adjustments to these map unit codes are listed in Table 4.2.

Table 4.1. List of associations found in Voyageurs National Park, organized by ecological system and their relation to map units.

System	A-type	Association (plant community type)	CEGL Code	Map Unit Link
BOG	A1	Black Spruce Bog	2485	BSB
	A2	Black Spruce / Leatherleaf Semi-treed Bog	5218+	LBC^t (shares)
	A3	Leatherleaf Bog	5278+	LBC^t (shares)
POOR SWAMP	A4	Black Spruce / Labrador Tea Poor Swamp	2454	BSL (evergreen), BST (mixed, with tamarack), and BSO^t (open, BBX when mosaic/complex)
POOR FEN	A5	Tamarack Scrub Poor Fen	5226	TF
	A6	Leatherleaf Poor Fen	5277*	LPF^t (BBX when beaver mosaic/complex)
	A7	Northern Sedge Poor Fen	2265+	SPF (shares)

RICH FEN	A8	Bog Birch - Willow Shore Fen	5227	BBSF
	A9	Leatherleaf - Sweet Gale Shore Fen	5228*	LSF (BBX when mosaic/complex)
	A10	Boreal Sedge Rich Fen	2500+	SPF[t] (shares)
	A11	Wiregrass Sedge Shore Fen	5229**	SMX (shares)
RICH SWAMP	A12	White Cedar - Boreal Conifer Mesic Forest	2449	WCU
	A13	Trembling Aspen - Balsam Poplar Lowland Forest	5036	AL
	A14	Black Ash - Mixed Hardwood Swamp	2105	BA
	A15	White Cedar - Black Ash Swamp	5165	WCBA
	A16	Black Spruce / Alder Rich Swamp	2452	BSAS
	A17	White Cedar - (Mixed Conifer) / Alder Swamp	2456	WCS (swamp) and WCT (peat, with tamarack)
	A18	Northern Tamarack Rich Swamp	2471	TA
	A19	Speckled Alder Swamp	2381	AS
WET MEADOW -	A21	Dogwood - Pussy Willow Swamp	2186	DS
SHRUB SWAMP	A22	Northern Sedge Wet Meadow	2257**	SMX (shares)
	A23	Canada Bluejoint Eastern Meadow	5174*	BJ (SMX when mosaic/complex)

FRESHWATER MARSH	A24	Midwest Cattail Deep Marsh	2233*	CM (DMX & SMX when mosaic/complex)
	A25	Eastern Reed Marsh	4141*	PM (DMX & SMX when mosaic/complex)
	A26	Freshwater Bulrush Marsh	2225*	BM (DMX when mosaic/complex)
	A27	Water Horsetail - Spikerush Marsh	5258**	DMX (shares)
	A28	Wild Rice Marsh	2382*	WRM (DMX when mosaic/complex)
	A29	Midwest Pondweed Submerged Aquatic Wetland	2282*	PW (DMX and BBX when mosaic/complex)
	A30	Northern Water Lily Aquatic Wetland	2562*	WL (DMX and BBX when mosaic/complex)
ROCKY OUTCROP / WOODLAND	A31	Jack Pine / Lichen Rocky Barrens	2491	JPL
	A32	Boreal Pine Rocky Woodland	2483	JPW (jack pine) & JPM (mixed pine)
	A33	Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland	5246	OW (deciduous), JPOM (jack pine-oak), and MPHW (mixed pine-oak)
	A34	Mixed Aspen Rocky Woodland	2487	ABW
	A35	Boreal Hazelnut - Serviceberry Rocky Shrubland	5197	UBS
	A35a	Poverty Grass Granite Barrens	5157	MGF
NORTHERN PINE - (OAK) FOREST	A36	Red Pine / Blueberry Dry Forest	2443*	RP (WRPA when mosaic with AB)
	A37	Red Pine - Aspen - Birch Forest	2520**+	WRPA (shares)
	A38	White Pine - Aspen - Birch Forest	2479**+	WRPA (shares)
	A39	White Pine / Mountain Maple Mesic Forest	2445*	WP (WRPA when mosaic with AB)

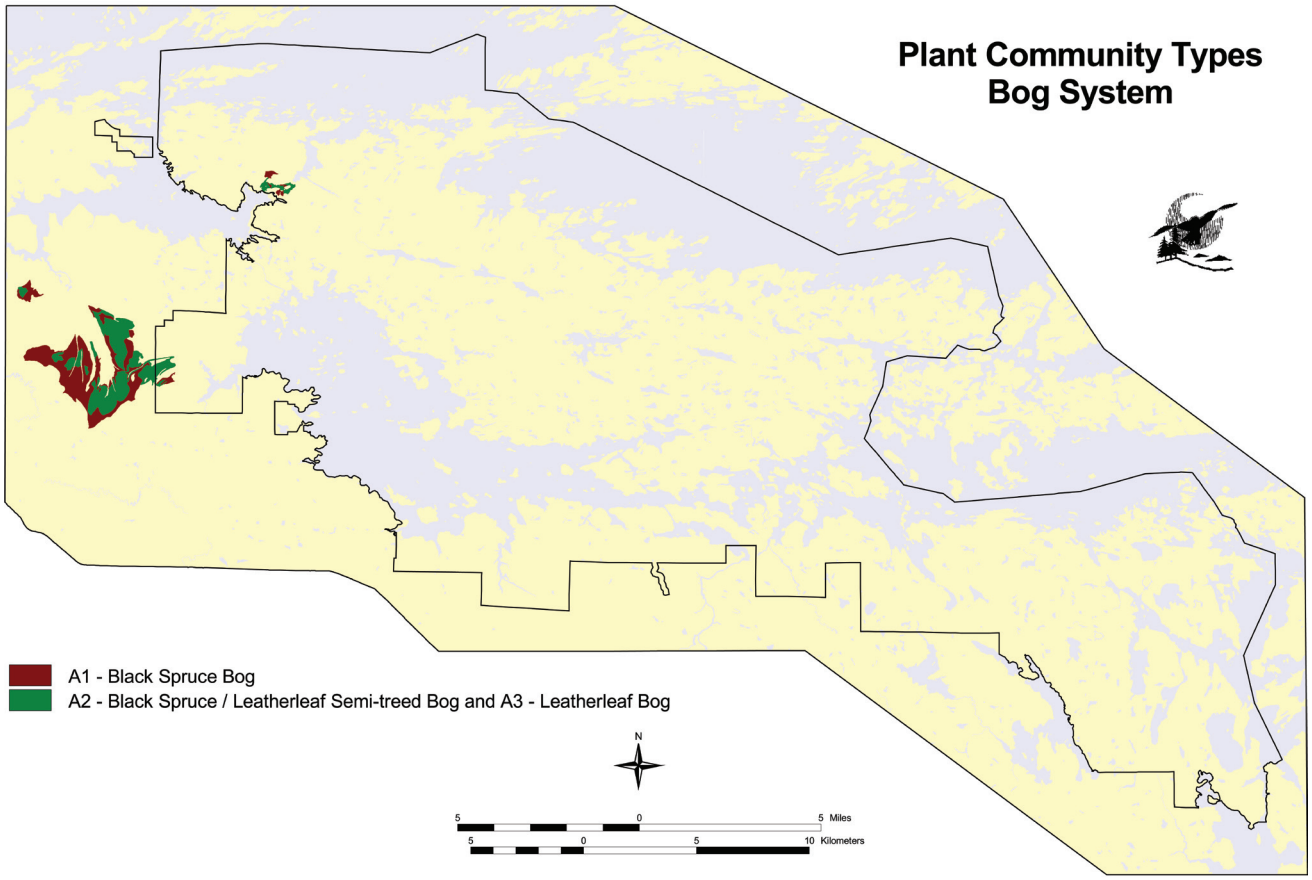
JACK PINE - BLACK SPRUCE FOREST	A40	Jack Pine / Balsam Fir Forest	2437*	JPF (JPAX when mosaic with AB)
	A41	Jack Pine - Aspen / Bush Honeysuckle Forest	2518**	JPAX (shares)
	A42	Black Spruce / Feathermoss Forest	2447	BSF
WHITE SPRUCE - FIR FOREST	A43	Spruce - Fir / Mountain Maple Forest	2446	SF
	A44	Spruce - Fir - Aspen Forest	2475	SFA
ASPEN - BIRCH FOREST	A45	Paper Birch / Fir Forest	2463	PB
	A46	Aspen - Birch / Boreal Conifer Forest	2466*+	AB (shares, JPAX and WRPA when mosaic)
	A47	Aspen - Birch - Red Maple Forest	2467*+	AB (shares, JPAX and WRPA when mosaic)
NORTHERN HARDWOODS (CONIFER) FOREST	A48	White Cedar - Yellow Birch Forest	2450	WCA
	A49	Northern Bur Oak Mesic Forest	2072	BO

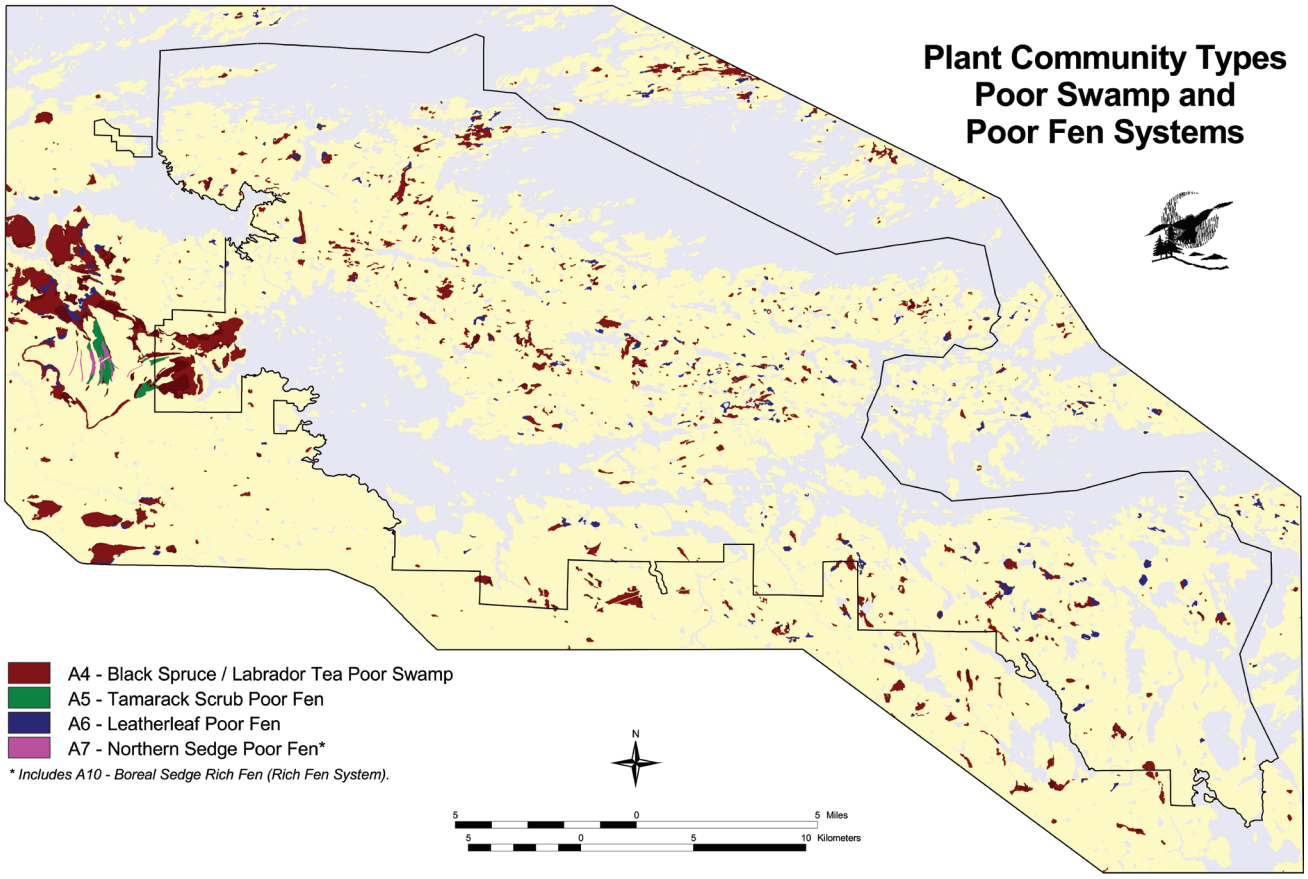
Table 4.2. Adjustments necessary to the original vegetation map to match this field guide and the revised plant community descriptions.

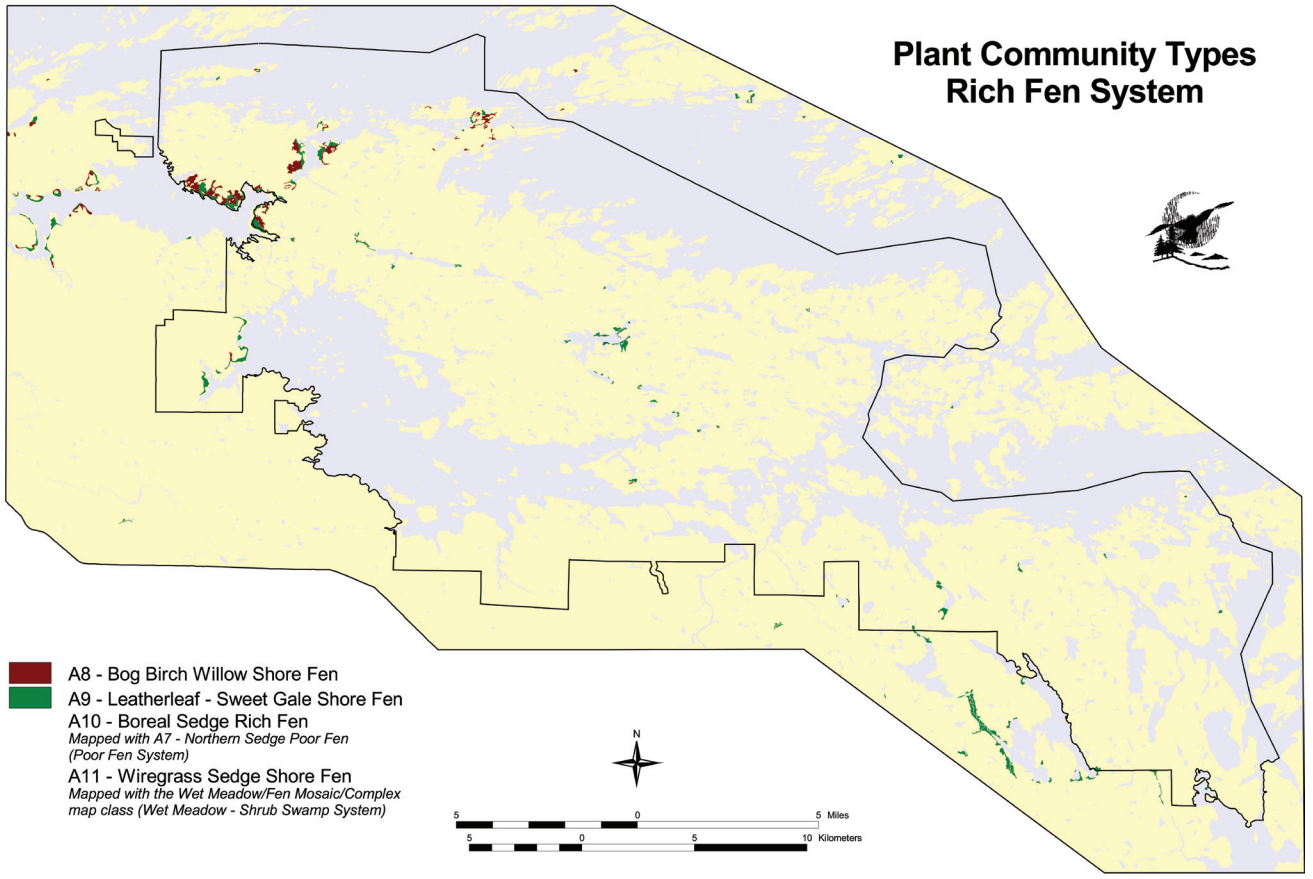
A-type	Association	CEGL Code	Field Guide Map Code	Vegetation Map Code (2001)	Explanation and adjustment necessary to the vegetation map
A2	Black Spruce / Leatherleaf Semi-treed Bog	5218*+	LBC[t]	LBC	At the time of mapping, this association (A2) and the open version of the Black Spruce / Labrador Tea Poor Swamp association (A4), which is now acknowledged in this guide, were not recognized as distinct, so the LBC map unit was based on a broader concept. Under the revised concept, all LBC map unit polygons of the original vegetation map that are within the Rat Root River Peatland bog complex (five polygons) and the small bog complex between Black Bay and Cranberry Bay (one polygon) now represent the A2 association. In this guide, we link this association to the Black Spruce / Leatherleaf Semi-treed Bog (LBC) map unit. In contrast, all LBC polygons external and along the margins of these bog complexes are now the open version of the Black Spruce / Labrador Tea Poor Swamp (A4). See A4 below for map unit link.
A3	Leatherleaf Bog	5278*+	LBC[t]	LB	At the time of mapping, this association and the Leatherleaf Poor Fen (A6), which is now acknowledged in this guide, were not recognized as distinct, so the LB map unit was based on a broader concept. Under the revised concept, the Leatherleaf Bog association (A3) only occurs within the bog portions of the Rat Root River Peatland bog complex and possibly within the small bog complex between Black Bay and Cranberry Bay. The A3 association is likely mapped along with A2 in the revised LBC map unit. No map unit polygons for A3 were originally mapped within the Rat Root River Peatland bog complex or the small bog complex between Black Bay and Cranberry Bay. Thus, there are no LB polygons of the original vegetation map that represent the A3 association. Rather, LB now represent the A6 association (which occurs outside of the Rat Root River Peatland). See A6 below for map unit link.

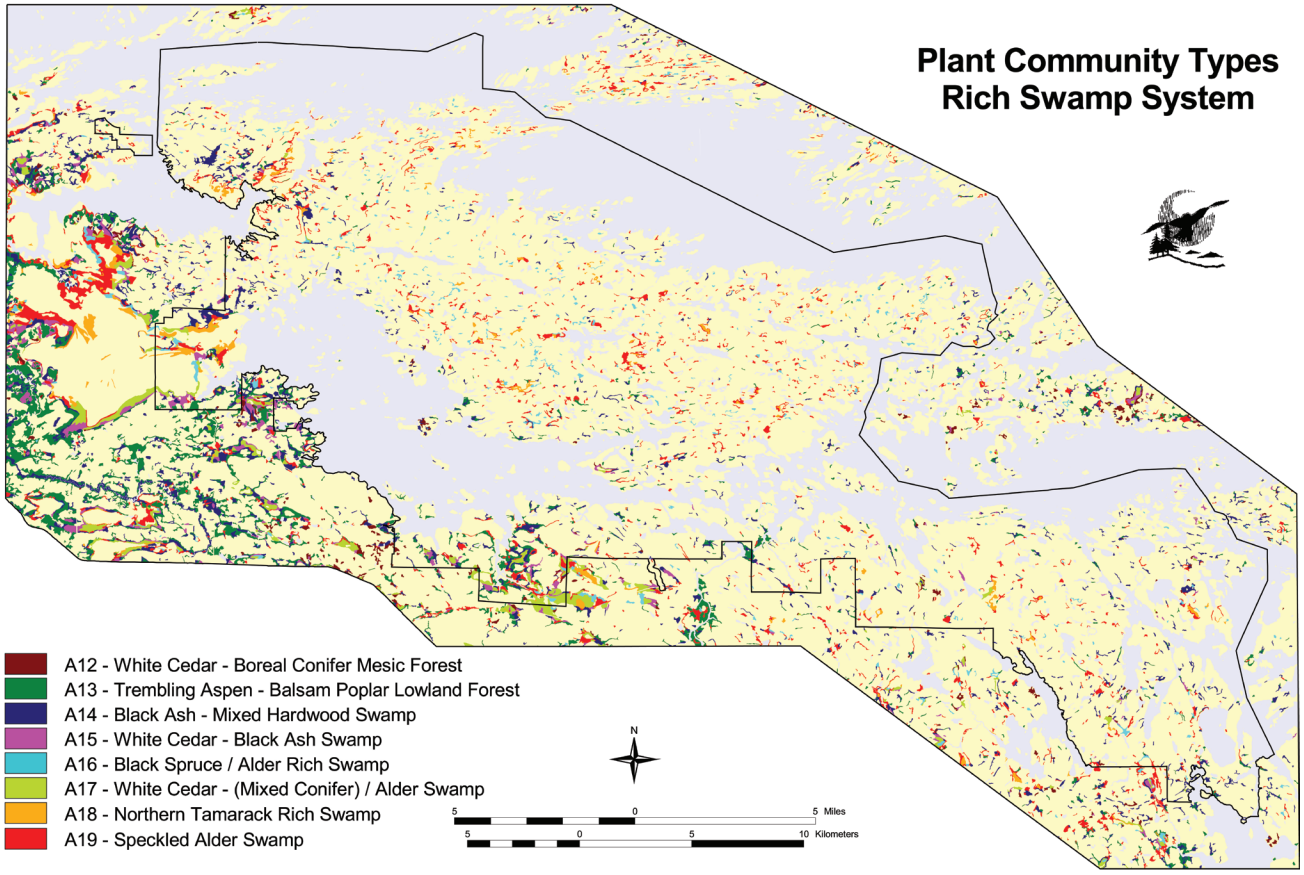
A4	Black Spruce / Labrador Tea Poor Swamp	2454	BSO[t]	LBC	At the time of mapping, the open version of this association (A4), which is now acknowledged in this guide, and the Black Spruce / Leatherleaf Semi-treed Bog association (A2), were not recognized as distinct, so the LBC map unit was based on a broader concept. Under the revised concept, all LBC map unit polygons of the original vegetation map, except those found within the Rat Root River Peatland bog complex and the small bog complex between Black Bay and Cranberry Bay, now represent the open version of the A4 association. In this guide, we link the open version of this association to a new map unit phase, the Black Spruce / Labrador Tea Open Swamp (open canopy phase, BSO) joining two other map unit phases of the A4 association (the evergreen phase, BSL and the mixed phase, BST). In contrast, all LBC polygons within these bog complexes are now the Black Spruce / Leatherleaf Semi-treed Bog association (A2). See A2 above for map unit link.
A6	Leatherleaf Poor Fen	5277*	LPF[t]	LB	At the time of mapping, this association (A6), which is now acknowledged in this guide, and the Leatherleaf Bog (A3), were not recognized as distinct, so the LB map unit was based on a broader concept that included both A3 and A6. Under the revised concept, all LB (A3) map unit polygons of the original vegetation map now represent the Leatherleaf Poor Fen association (A6). In this guide, we link A6 to the Leatherleaf Poor Fen (LPF). We eliminated the use of the LB map unit code altogether. There were no LB polygons mapped within the Rat Root River Peatland bog complex or the small bog complex between Black Bay and Cranberry Bay to consider any as being Leatherleaf Bog association (A3). See A2 above for map unit link.
A10	Boreal Sedge Rich Fen	2500	SPF[t]	None	This association was not initially recognized at the time of mapping, and thus was not assigned a map unit. It is considered a very localized type at or near Voyageurs National Park. It is presumably mapped within the Northern Sedge Poor Fen (SPF) map unit, a map unit originally designed to map locations of the Northern Sedge Poor Fen association (A7) in the Rat Root River Peatland bog complex. In this guide, we link the SPF map unit to both the A7 and A10 associations.

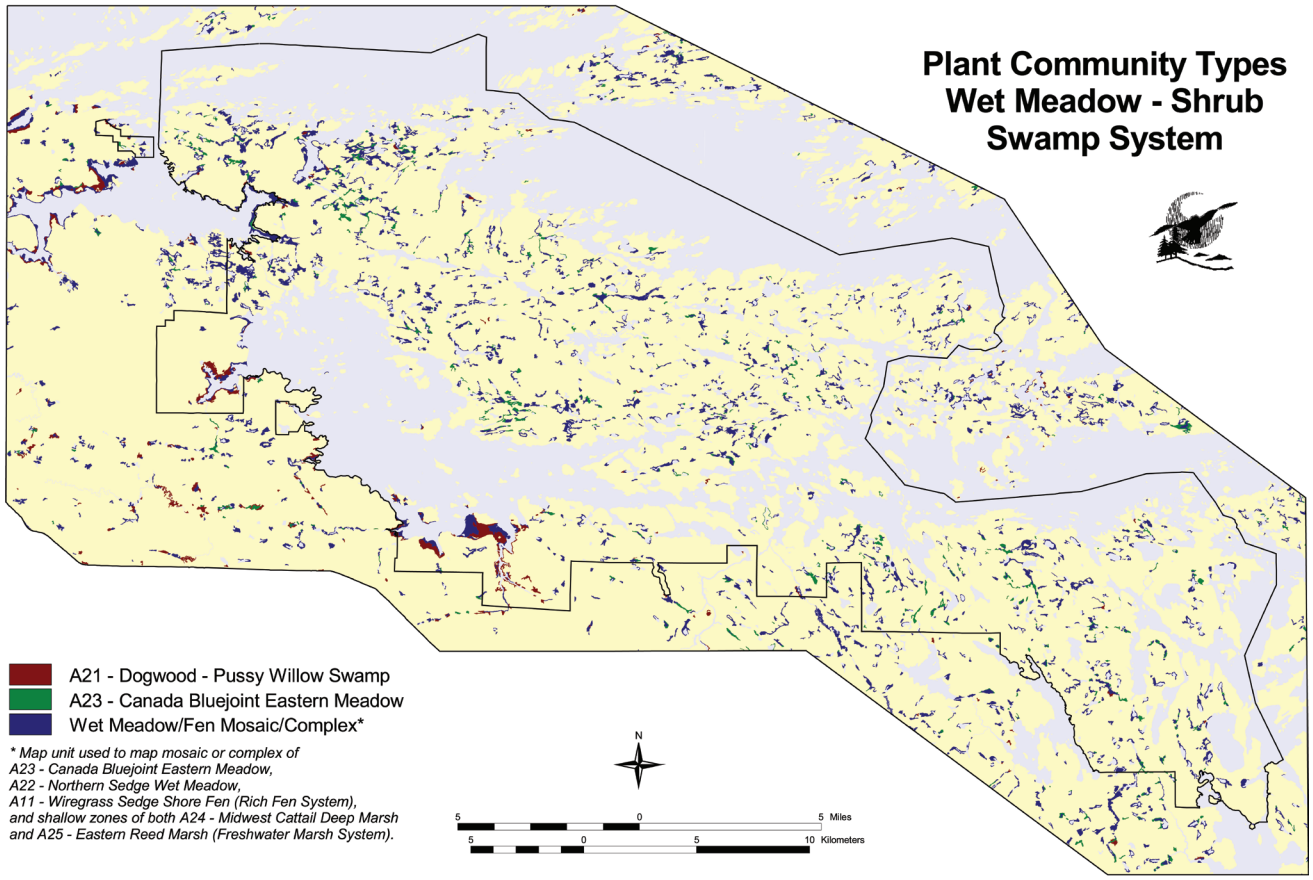
Appendix 5. Location Maps of the Associations and Ecological Systems of Voyageurs National Park

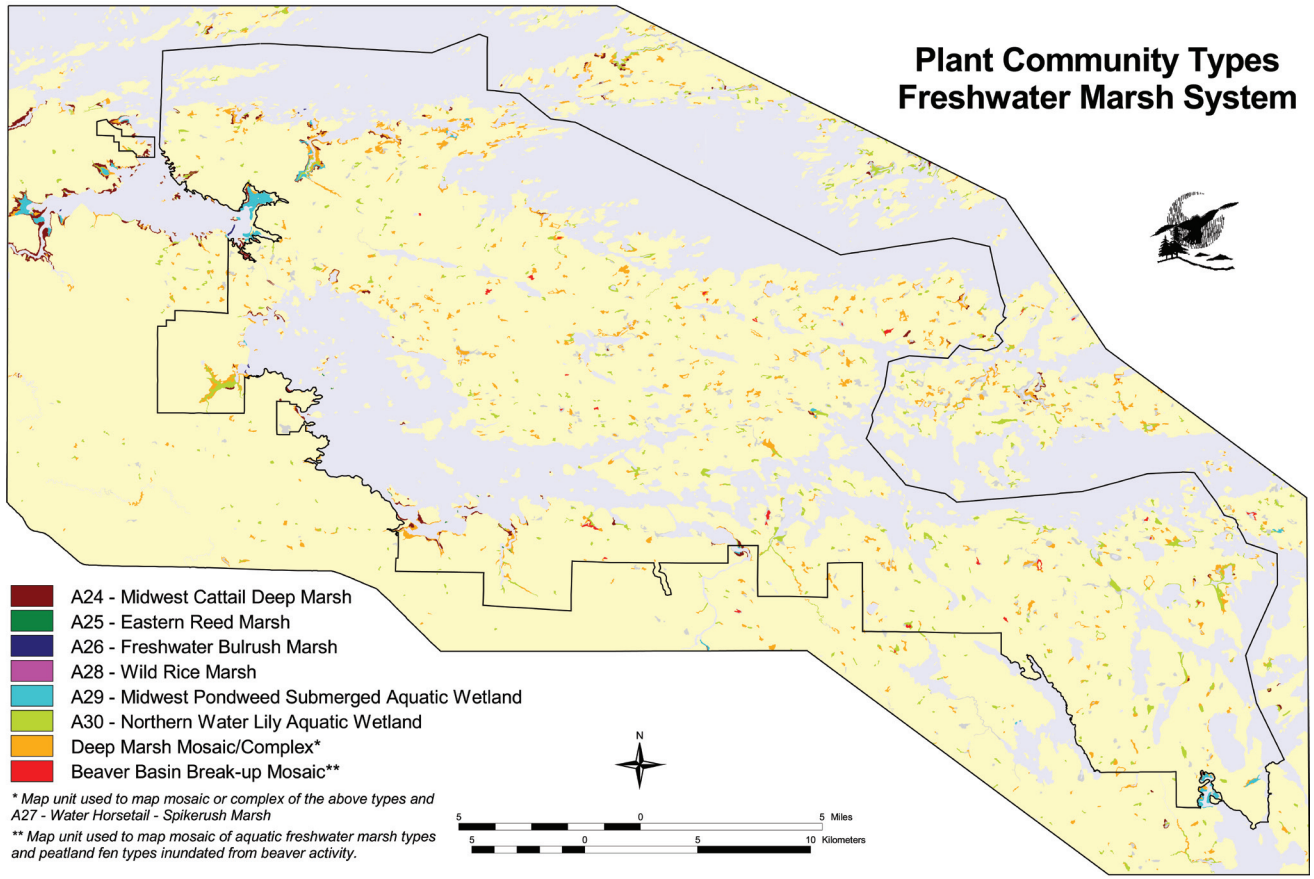


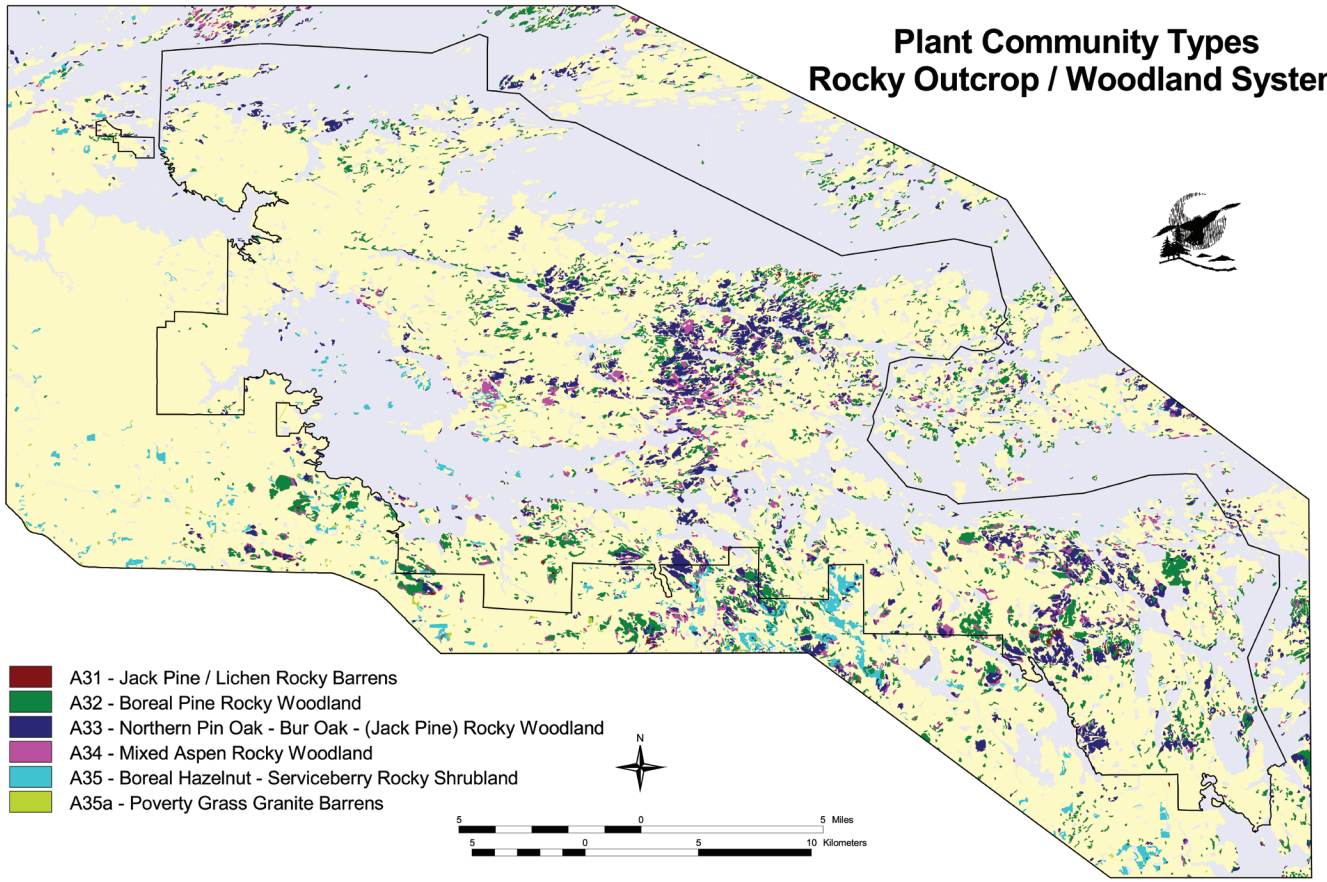

Plant Community Types
Poor Swamp and
Poor Fen Systems
A4 - Black Spruce / Labrador Tea Poor Swamp
A5 - Tamarack Scrub Poor Fen
A6 - Leatherleaf Poor Fen
A7 - Northern Sedge Poor Fen*
* Includes A10 - Boreal Sedge Rich Fen (Rich Fen System).
N
5 0 5 Miles
5 0 5 10 Kilometers

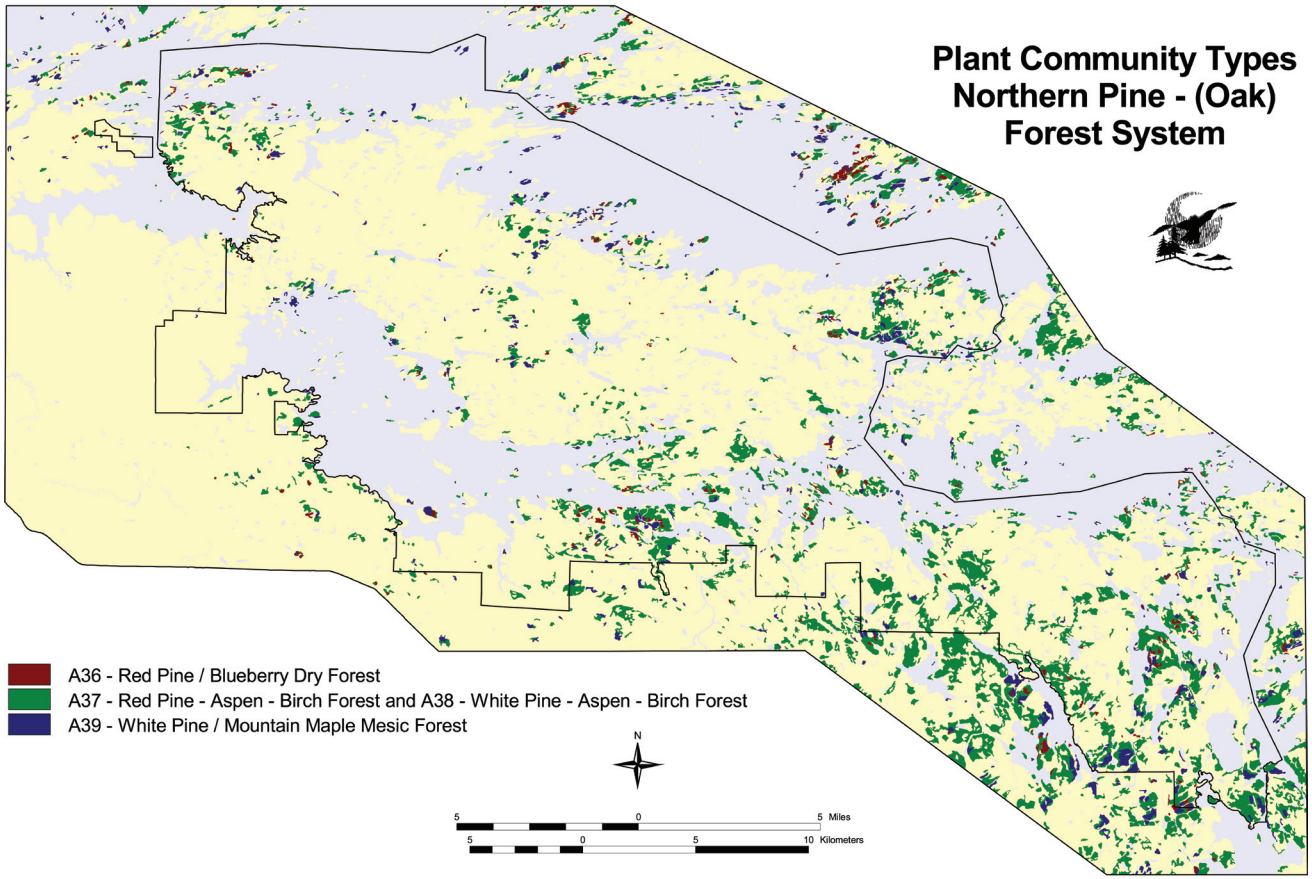

Plant Community Types
Rich Fen System
A8 - Bog Birch Willow Shore Fen
A9 - Leatherleaf - Sweet Gale Shore Fen
A10 - Boreal Sedge Rich Fen
Mapped with A7 - Northern Sedge Poor Fen
(Poor Fen System)
A11 - Wiregrass Sedge Shore Fen
Mapped with the Wet Meadow/Fen Mosaic/Complex
map class (Wet Meadow - Shrub Swamp System)
N
5 0 5 Miles
5 0 5 10 Kilometers

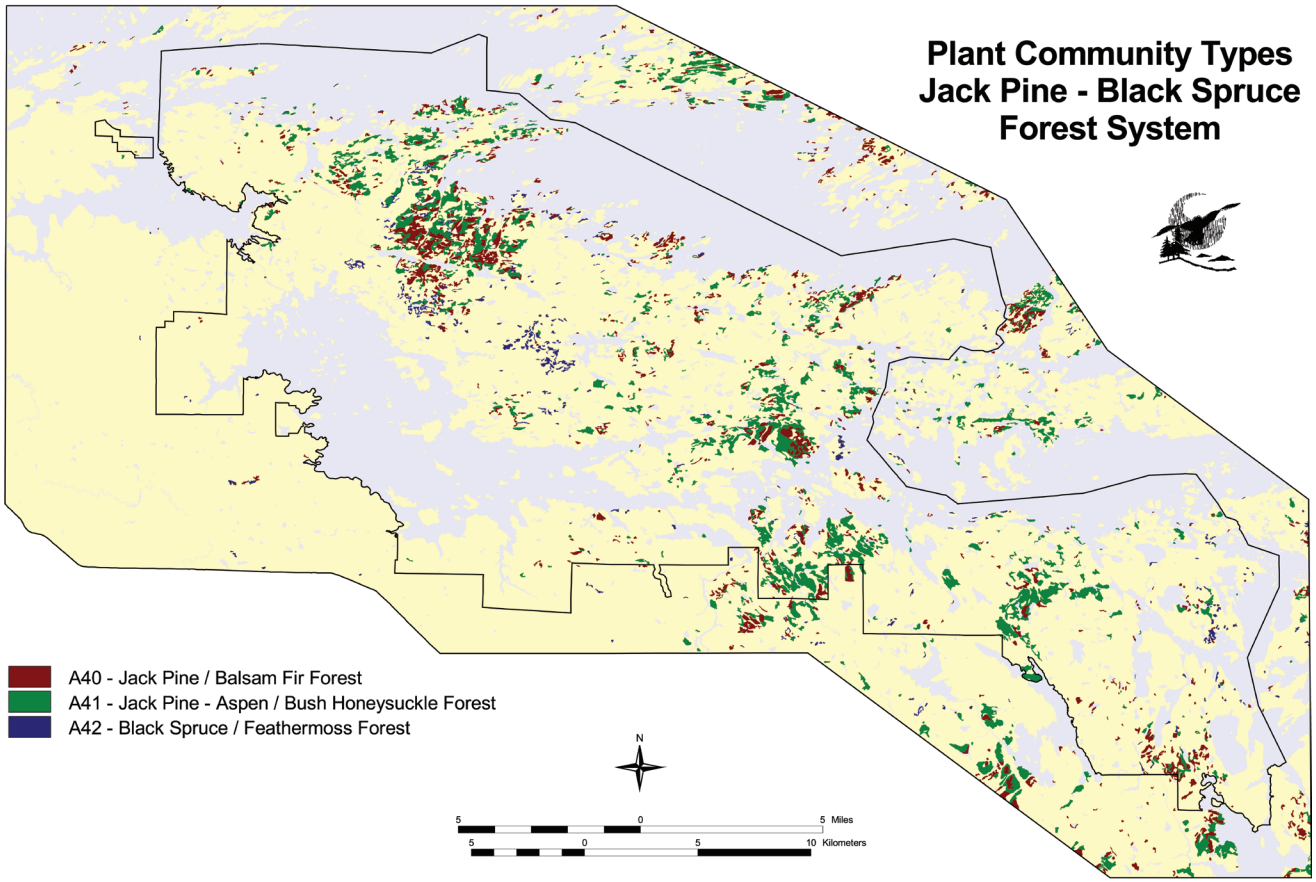

Plant Community Types
Rich Swamp System
A12 - White Cedar - Boreal Conifer Mesic Forest
A13 - Trembling Aspen - Balsam Poplar Lowland Forest
A14 - Black Ash - Mixed Hardwood Swamp
A15 - White Cedar - Black Ash Swamp
A16 - Black Spruce / Alder Rich Swamp
A17 - White Cedar - (Mixed Conifer) / Alder Swamp
A18 - Northern Tamarack Rich Swamp
A19 - Speckled Alder Swamp
N
5 0 5 Miles
5 0 5 10 Kilometers

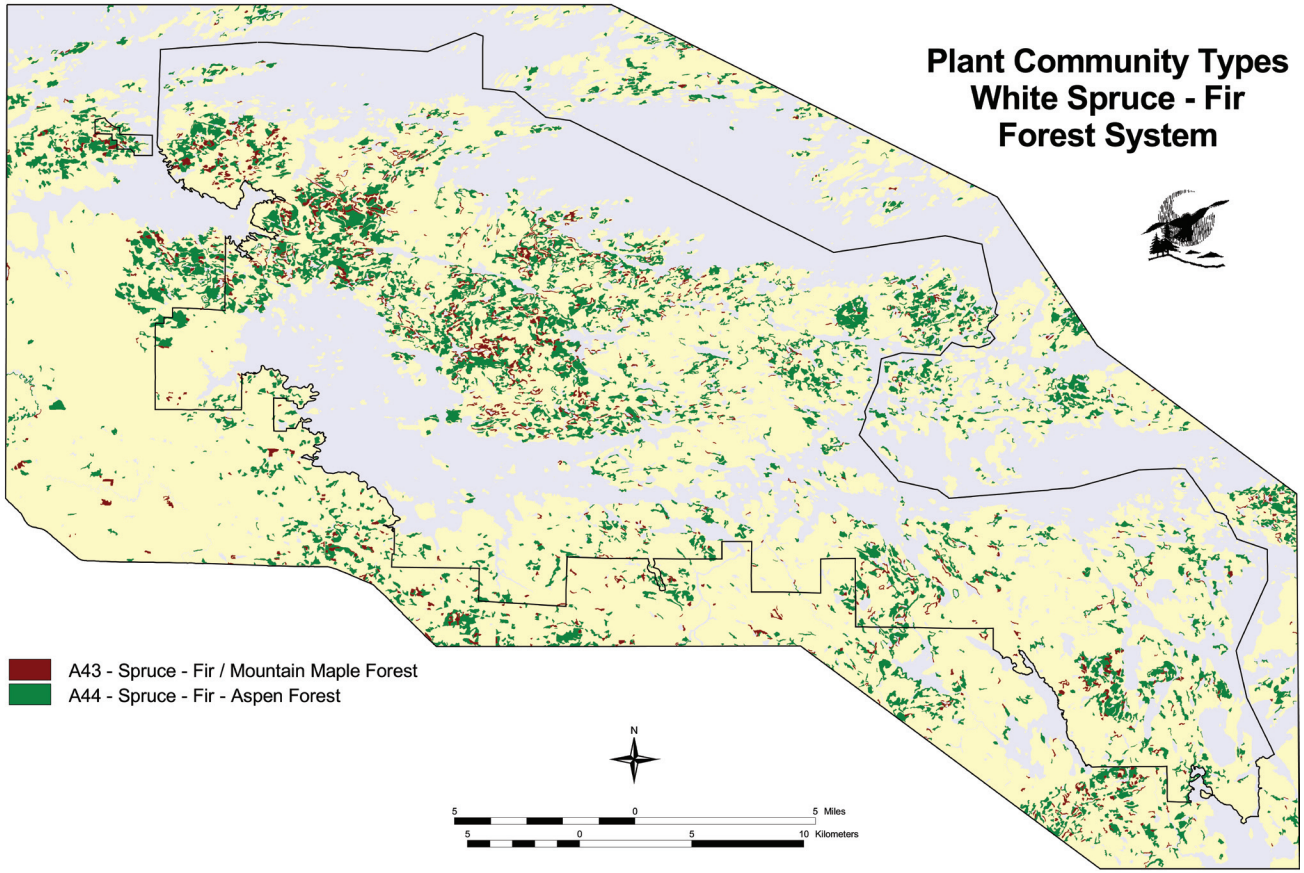

Plant Community Types
Wet Meadow - Shrub
Swamp System
A21 - Dogwood - Pussy Willow Swamp
A23 - Canada Bluejoint Eastern Meadow
Wet Meadow/Fen Mosaic/Complex*
* Map unit used to map mosaic or complex of
A23 - Canada Bluejoint Eastern Meadow,
A22 - Northern Sedge Wet Meadow,
A11 - Wiregrass Sedge Shore Fen (Rich Fen System),
and shallow zones of both A24 - Midwest Cattail Deep Marsh
and A25 - Eastern Reed Marsh (Freshwater Marsh System).
N
5 0 5 Miles
5 0 5 10 Kilometers

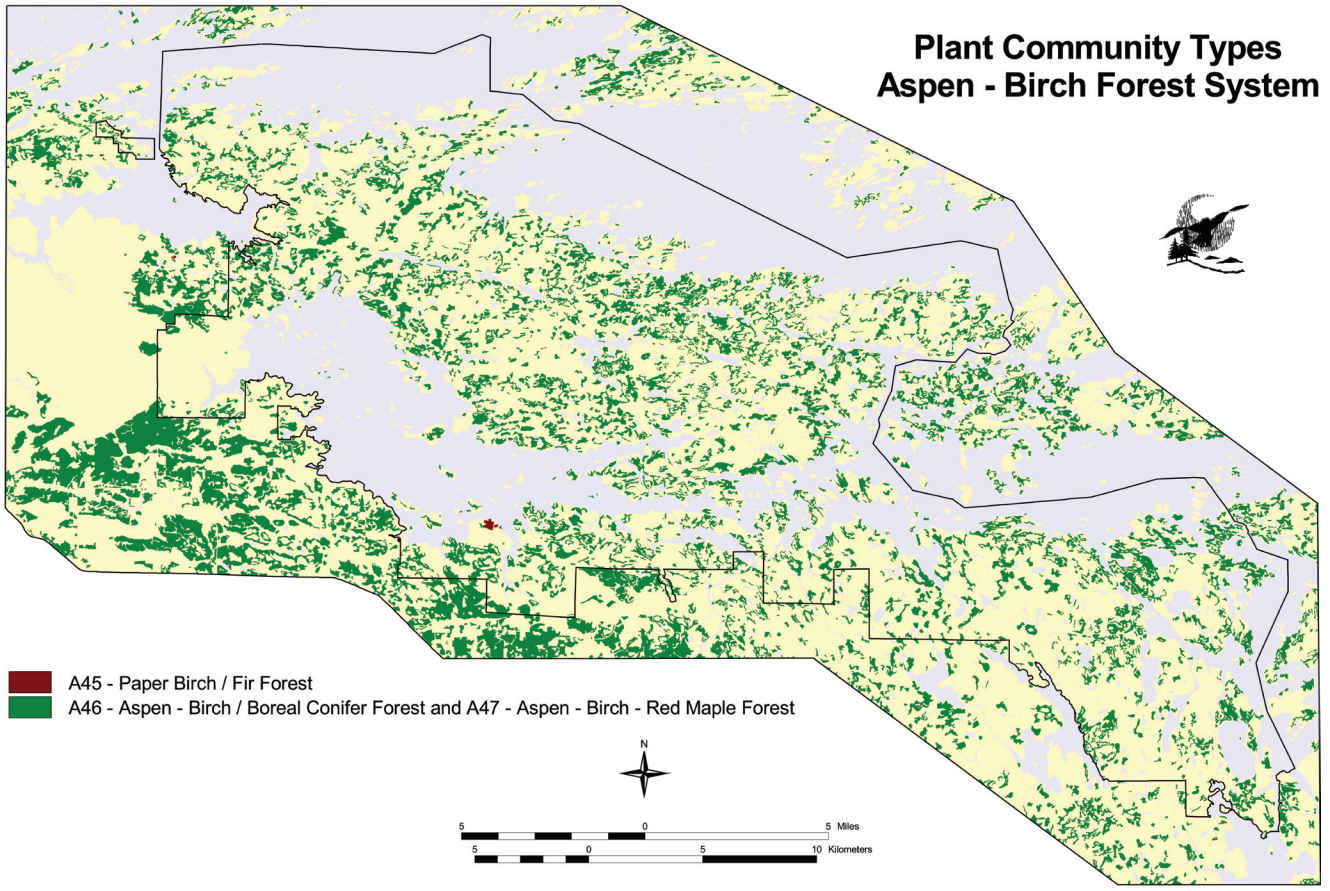

Plant Community Types
Freshwater Marsh System
A24 - Midwest Cattail Deep Marsh
A25 - Eastern Reed Marsh
A26 - Freshwater Bulrush Marsh
A28 - Wild Rice Marsh
A29 - Midwest Pondweed Submerged Aquatic Wetland
A30 - Northern Water Lily Aquatic Wetland
Deep Marsh Mosaic/Complex*
Beaver Basin Break-up Mosaic**
* Map unit used to map mosaic or complex of the above types and A27 - Water Horsetail - Spikerush Marsh
** Map unit used to map mosaic of aquatic freshwater marsh types and peatland fen types inundated from beaver activity.
N
5 0 5 Miles
5 0 5 10 Kilometers

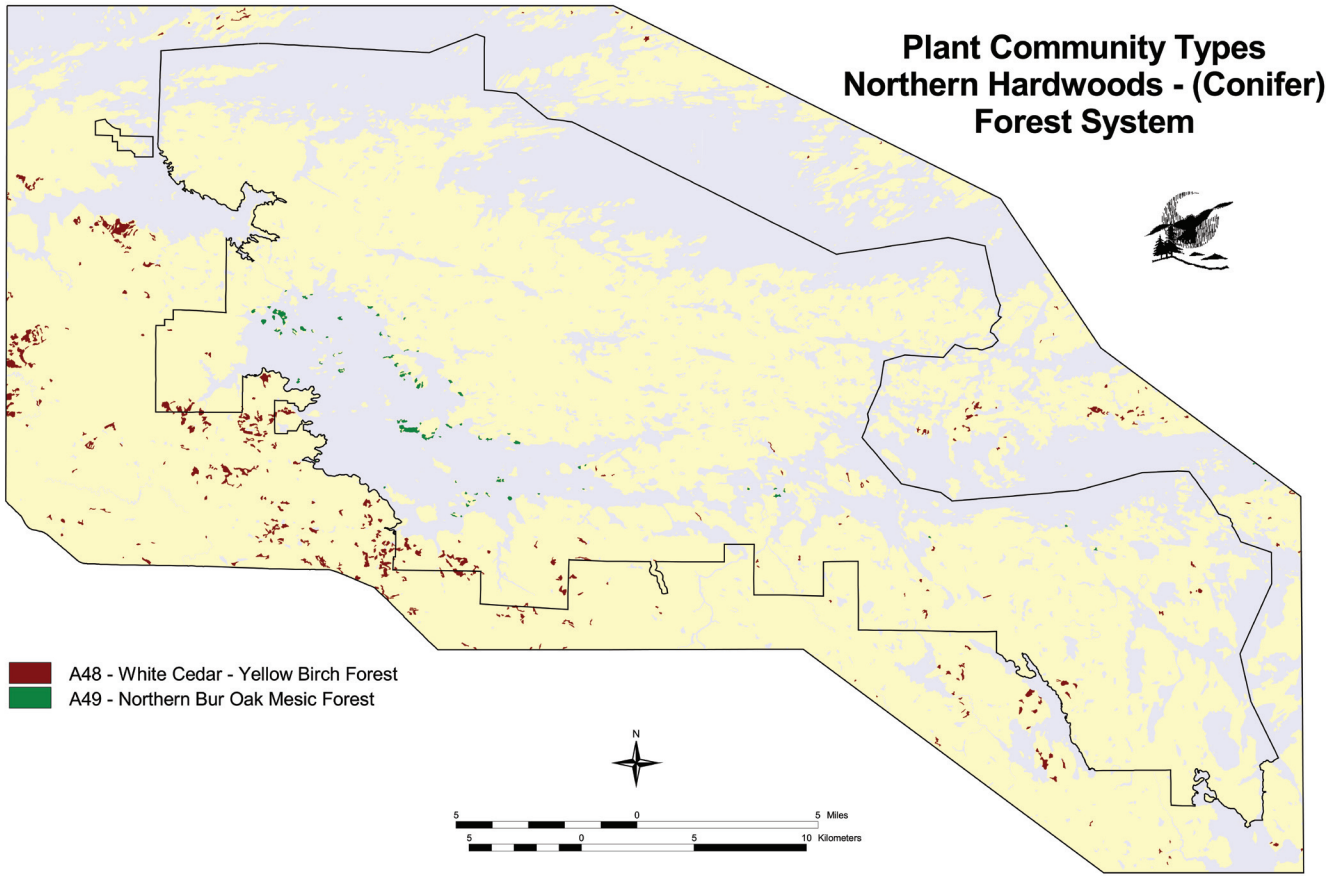

Plant Community Types
Rocky Outcrop / Woodland System
A31 - Jack Pine / Lichen Rocky Barrens
A32 - Boreal Pine Rocky Woodland
A33 - Northern Pin Oak - Bur Oak - (Jack Pine) Rocky Woodland
A34 - Mixed Aspen Rocky Woodland
A35 - Boreal Hazelnut - Serviceberry Rocky Shrubland
A35a - Poverty Grass Granite Barrens
N
5 0 5 Miles
5 0 5 10 Kilometers


Plant Community Types
Northern Pine - (Oak)
Forest System
A36 - Red Pine / Blueberry Dry Forest
A37 - Red Pine - Aspen - Birch Forest and A38 - White Pine - Aspen - Birch Forest
A39 - White Pine / Mountain Maple Mesic Forest
N
5 0 5 Miles
5 0 5 10 Kilometers


Plant Community Types
Jack Pine - Black Spruce
Forest System
A40 - Jack Pine / Balsam Fir Forest
A41 - Jack Pine - Aspen / Bush Honeysuckle Forest
A42 - Black Spruce / Feathermoss Forest
N
5 0 5 Miles
5 0 5 10 Kilometers


Plant Community Types
White Spruce - Fir
Forest System
A43 - Spruce - Fir / Mountain Maple Forest
A44 - Spruce - Fir - Aspen Forest
N
5 0 5 Miles
5 0 5 10 Kilometers


Plant Community Types
Aspen - Birch Forest System
A45 - Paper Birch / Fir Forest
A46 - Aspen - Birch / Boreal Conifer Forest and A47 - Aspen - Birch - Red Maple Forest
N
5 0 5 Miles
5 0 5 10 Kilometers


Plant Community Types
Northern Hardwoods - (Conifer)
Forest System
A48 - White Cedar - Yellow Birch Forest
A49 - Northern Bur Oak Mesic Forest
N
5 0 5 Miles
5 0 5 10 Kilometers

USGS science for a changing world

Faber-Langendoen and others—**Field Guide to the Plant Community Types of Voyageurs NP**—Techniques and Methods 2–A4